Long-term intermittent haemodialysis in Egypt

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The pattern of mortalities from genitourinary diseases in Egypt was analysed from recent official figures. On the basis of certain assumptions concerning etiology, age, and geographical distribution, it was estimated that 37.7 per million of the general population would benefit from regular dialysis treatment, though the facilities available will permit only 5 % of these subjects to receive treatment in 1975. As other diseases and conditions are much more prevalent, no great relative increase in dialysis facilities in Egypt is anticipated in the near future. A computer-controlled plan is suggested for organizing regular dialysis treatment at the national level to ensure an appropriate choice of medically suitable subjects of highest value to the community. Means of reducing the need for dialysis by minimizing the incidence of terminal chronic renal failure and of making best use of the available facilities are discussed.

Egyptian hospitals first gave recognition to the artificial kidney in 1958,[a] but a successful dialysis service was not provided until early 1964, when a case of barbiturate poisoning was saved by haemodialysis followed by prolonged peritoneal lavage (3). The first attempt with long-term intermittent haemodialysis was made later in 1964, though the results then were unsatisfactory (4). The experience of the first dialysis centre now extends to over 2 000 dialysis treatments and 25 patients treated by long-term intermittent haemodialysis. Ten other centres were established, of which 3 are providing long-term dialysis treatment on a small scale. Subjects are generally chosen for dialysis on the " first come, first served " principle, which does not discriminate between patients except on medical grounds. Though acceptable from the moral standpoint, this system does not take into account the value of a particular patient to the community and frequently denies the chance of dialytic treatment to, for example, an eminent writer, scientist, artist, or journalist simply because of lack of vacancies. As this uncontrolled system represents a considerable waste of the resources of a developing country, it seems mandatory to plan for an organized, well controlled programme that provides the community with a reasonable return in exchange for the relatively high cost of regular dialytic treatment.

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[a] Ezzat, E. (1958), M.D. thesis. Ain Shams University, Cairo.

THE PRESENT POSITION

The size of the problem was gauged from mortalities from renal diseases in Egypt, which were calculated from official data published by the Egyptian Central Agency for Public Mobilisation and Statistics (CAPMS) (2). These data are presented here according to the eighth revision of the International Classification of Diseases (ICD) (6). Details of dialysis units in Egypt were obtained from the National Society of Nephrology and through personal communication with the directors of individual units.

The need for regular dialysis treatment in Egypt

The reported mortalities from genitourinary diseases (ICD Nos. 580–629) in Egypt from 1960 to 1970 are shown in Fig. 1. They represent an annual mean of 193 deaths per million of the general population.

In an attempt to estimate the number of cases included under genitourinary mortalities in which the patient would have benefited from regular dialytic treatment, we studied the effects of etiology, age, and geographical distribution according to the latest (1970) CAPMS report (2).

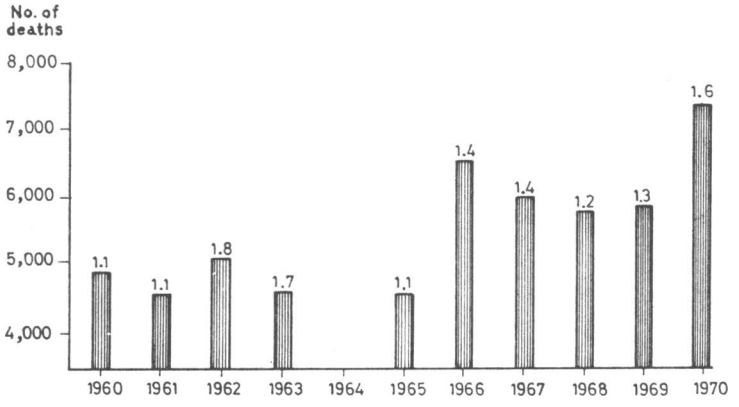

Fig. 1. Mortality from genitourinary diseases in Egypt, 1960–1970. The figures above the columns show the percentage of deaths from all causes represented by these totals.

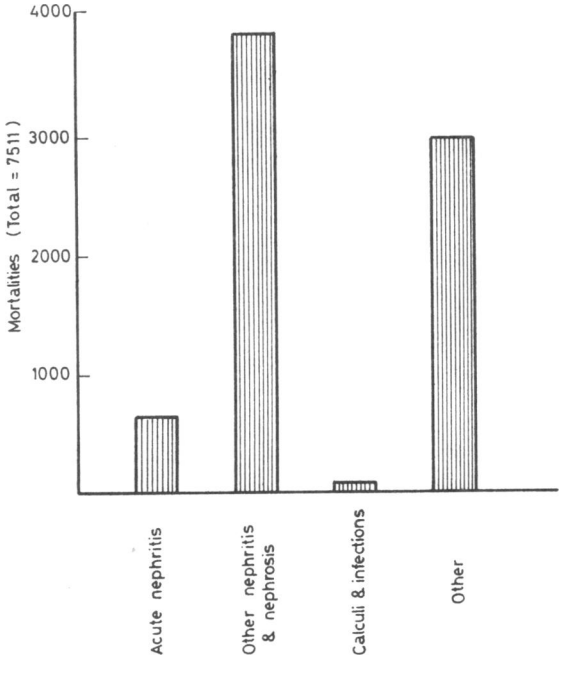

Fig. 2. Mortality from genitourinary diseases in Egypt, 1970.

Etiology. Detailed etiological information is lacking among the CAPMS data but, as Fig. 2 indicates, most of the subjects who would have benefited from regular dialysis treatment must have been included under the heading " Other nephritis and nephrosis " in the ICD list of 150 causes of morbidity and mortality. These cases accounted for about half the genitourinary mortalities in 1970.

Age. The age distribution of 1970 mortalities from " other nephritis and nephrosis " (Fig. 3) shows that after an initial peak in the first 5 years of life mortality declined for the age groups between 5 and 29 years, to be followed by another distinct and persistent peak between the ages of 30 and 70 years. Taking into account the sociopsychological profile of the Egyptian population, the age range 30–59 years may be considered optimal for regular dialysis treatment. Of the subjects who died in 1970 from " other nephritis and nephrosis ", 47.5% were within this range.

Geographical distribution. In view of the present availability of dialysis centres in Egypt, the transport facilities, and the nature of the jobs people do in different parts of the country, it is presumed that candidates for regular dialysis would be almost exclusively residents of urban areas. According to the 1970 CAPMS report, 52.3% of subjects dying of " other nephritis and nephrosis " were urban inhabitants.

Estimates for 1975. According to the above assumptions, 994 subjects would have been indicated for regular dialysis treatment in 1970. These represented 12.6% of the genitourinary mortalities and 37.7 per million of the general population in the same year. With a rate of natural population increase of 2.24% a year (2), it may be expected that 1 278 patients will need regular dialysis in 1975.

Availability of regular dialysis treatment in Egypt

There are 11 dialysis centres in Egypt containing a total of 23 machines; thus 69 patients with chronic

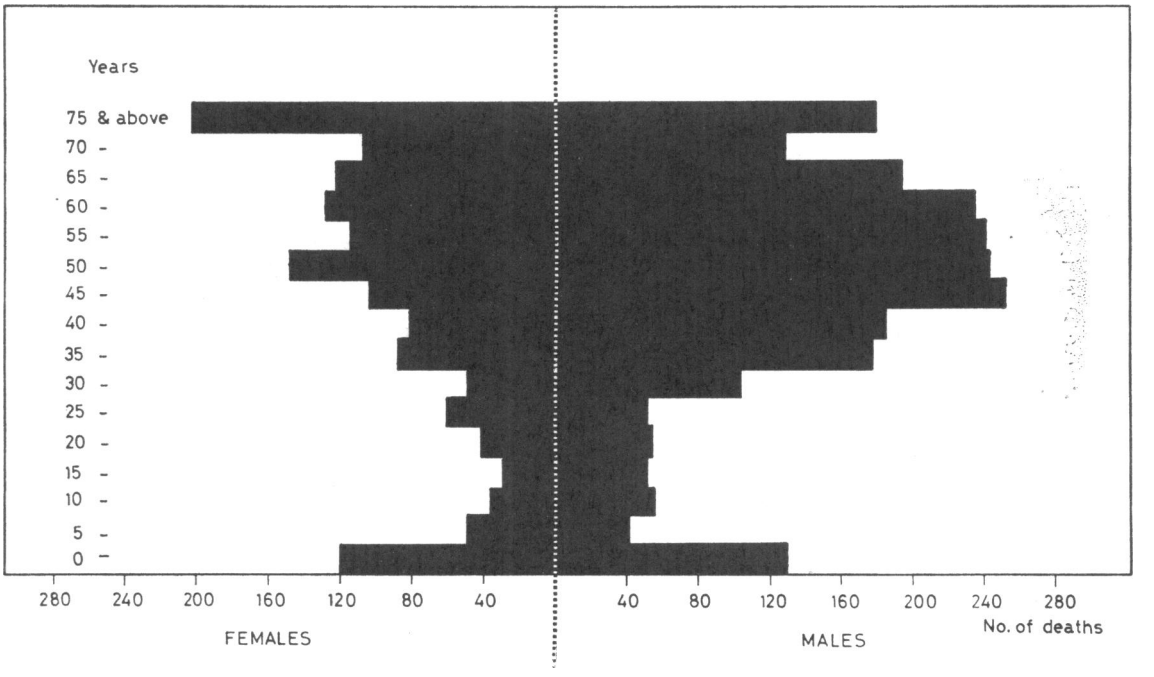

Fig. 3. Age distribution of deaths due to " other nephritis & nephrosis " in Egypt, 1970.

renal failure can be accommodated on the basis of twice-weekly dialysis. This means that only 5% of the candidates for dialysis in 1975 could be given the chance of treatment. This proportion would vary from 3% to 7% according to the geographical distribution of patients in relation to the centres (Fig. 4). However, caution must be used in extrapolating to 1975 the demographic data obtained in 1970, which were vitiated by the inclusion of immigrants from Sinai and the Suez Canal (1).

In order to keep the same standards for selection, and to avoid blockage of the available vacancies for dialysis, allowance must be made for the natural increase in the population in relation to the survival rate of patients treated by dialysis. According to recognized international standards (Hors, J., personal communication, 1973) and experience in Egyptian centres, this rate would average 70% a year. Assuming that the incidence of renal disease does not change in proportion to the general population for at least the next 5 years, it can be estimated that the available places for dialysis should be multiplied 3.18 times by the end of 1980, which would require the introduction of 50 new machines.

Cost of dialysis in Egypt

Following the recommendations of the Centre de recherches et de documentation sur la consommation, Paris (5), we estimated the cost per treatment in a single-bed, 5-bed, and 10-bed centre to be respectively 26.9, 17.8 and 16.6 Egyptian pounds (approximately equivalent to 45, 30, and 28 US dollars) (Table 2).[a] The calculations were made on the basis shown in Table 1.

Yearly cost of dialysis for one patient. Assuming that an average patient would need 120 treatments per year (5), the annual cost of dialysis would vary from £E 1 992 in a 10-bed unit to £E 3 228 in a single-bed unit.

In terms of the national economy, this cost would keep alive, for a mean of 2.87 years, a person whose average work capacity is 70%–90% of that of healthy individuals of his age (5). This rate would apply only for the 4 possible working days in each week, reducing the overall performance to 50% of

[a] Calculated at ' promotion rate ' (£E1=$1.67) prevailing in summer 1974.

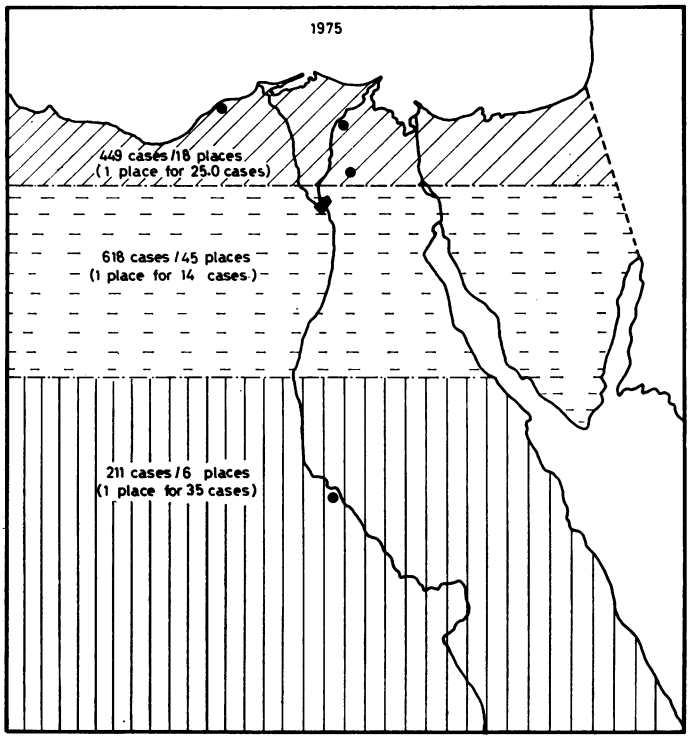

Fig. 4. Availability of regular dialysis service in Egypt, 1975. There is a total of 69 places for an anticipated 1278 cases (1 place for 18.0 cases).

normal. In other words, the yearly cost of £E 1 992–3 228 (US $3 320–5 380) would be spent for a net gain of half a year of activity. Furthermore, in statistical terms, if we accept a yearly mortality of 30%, then regular dialysis treatment would provide a net national gain of 320 patient-years for every 100 treated subjects at a cost of £E 0.64–1.03 million (US $1.07–1.7 million).

DISCUSSION AND PROPOSALS

According to our estimates, some 1 300 potentially suitable subjects will be left to die of chronic renal failure in 1975 if they are not treated by regular dialysis and at least in the foreseeable future this number will increase by 2.24% each year (2). This is certainly an underestimate, since the data obtained from death certificates do not include uraemic subjects who die of heart failure, hypertensive stroke, gastrointestinal haemorrhage, etc., when the true diagnosis is either missed owing to lack of medical and laboratory facilities, or intentionally omitted to avoid the medicolegal problems that might arise when the cause of death is shown to be " urea intoxication "—the Arabic expression for uraemia.

Moreover, in the assumptions used to estimate the number of subjects suited to regular dialysis treatment, we included only urban residents aged 30–59 years dying of " other nephritis and nephrosis ". This is clearly also an underestimate, since other subjects may satisfy the medical and sociopsychological requirements for treatment. It is noteworthy that renal failure in Egypt occurs predominantly in the villages, where schistosomiasis is prevalent, and particularly in age groups younger than our range of 30–59 years. Perhaps such patients would not be considered ideal for repeated dialysis in the initial phases of its introduction in a developing country, but they will certainly have to be given care at a later stage.

The unpalatable fact is that Egypt's present medical facilities can provide regular dialysis treatment

Table 1. Items considered in calculating the cost of dialysis [a]

Item	Useful life
1. Dialysis rooms and services	10 years
2. Permanent dialysis equipment	
Blood pumps	3 years
Monitoring	4 years
Dialyzer	5 years
Surgical instruments	5 years
Water softeners	5 years
3. Disposable and consumable equipment	
Membranes	
Tubing (blood lines, heparin line, venous pressure line, etc.)	
Drugs (saline, heparin, formalin, etc.)	
Salts	
Laboratory	
4. Personnel	
Doctors, nurses, technicians and aides	
5. Miscellaneous	
Electricity, gas, water, entertainment, share in administration, laundry, etc.	
To the total expenses are added	
10% for maintenance	
5% for scientific improvement and research promotion	

[a] Based on scheme outlined by Lebart (2).

for only 5% of the (underestimated) number of potentially suitable candidates. It is unlikely that the dialysis service will expand to any significant extent in the near future since renal diseases can claim no priority over the country's other health problems. As noted, mortalities from genitourinary diseases as a whole account for less than 2% of all deaths during the past decade, while only 12.6% of these subjects would be considered ideal for dialytic treatment. It follows that we should plan to utilize the available facilities as efficiently as possible by providing a system for the proper choice of subjects for regular dialysis treatment.

A national dialysis programme

We suggest a national programme for regular dialysis treatment, based on standardized criteria for the selection of cases. This can be achieved by using a computer, which would avoid bias, provide an organized system for communication with patients and centres, and keep records for statistical purposes.

The computer would be fed on the one hand with data on candidates proposed for dialysis and on the other with information on vacancies in dialysis centres (Fig. 5). Its main job would be to choose the best candidate to be given priority in filling a particular vacancy, on the basis of a medical and socioeconomic evaluation.

Medical standards would be defined by reference to the experience of dialysis units of international reputation as well as to known national problems. Subjects satisfying certain minimum requirements (set out in Table 3) would collect points against dialysis according to the list suggested in Table 4.

Table 2. Cost of dialysis in units of different sizes (in Egyptian pounds)

Item	1-bed unit		5-bed unit		10-bed unit	
	A	B	A	B	A	B
Dialysis room	1 500	0.48	3 000	0.20	6 000	0.18
Dialysis equipment	5 000	4.10	25 000	3.87	48 000	3.62
Disposable equipment		9.00		9.00		9.00
Personnel (per year)	3 000	9.60	3 500	2.23	5 000	1.54
Other		0.30		0.20		0.10
Total		23.48		15.50		14.48
Total + 15%		26.90		17.80		16.60

A = capital cost.
B = cost per single treatment.

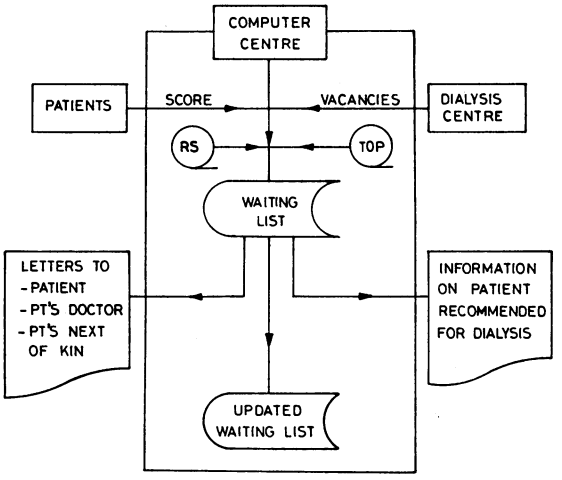

Fig. 5. Suggested computer system for a national chronic dialysis programme. RS = ranking system; TOP = patient turn-over parameters; PT = patient.

Table 3. Suggested minimum requirements for acceptance for regular dialysis treatment [a]

1. Uncompensatable chronic renal failure with creatinine clearance of less than 5 ml/min.
2. Renal disease should be the only primary disease the patient suffers from.
3. Complications of renal failure should be potentially reversible.
4. There should be at least 2 sites available for arteriovenous shunts.
5. The psychological build of the patient should be satisfactory to the nephrology team, which should include a psychiatrist familiar with the treatment.

[a] Agreed by consensus of 7 Egyptian consultant nephrologists.

Under our proposal, socioeconomic evaluation is the job of a special board, which would study the curriculum vitae of the candidate with the object of assessing the benefit to the country in scientific, literary, economic, and artistic terms if he were given

Table 4. Suggested score for contraindications to regular dialysis treatment [a]

Hypertension			*Osteodystrophy*		
Diastolic blood pressure	below 110	1	Subjective only		1
	110–130	2	Radiological decalcification		2
	above 130	3	Established hyperparathyroidism		3
Heart failure			*Polyneuropathy*		
Failing side	left	2	Sensory	subjective only	1
	right	3		objective	2
Duration	less than a month	1	Motor	subjective only	2
	more than a month	2		objective	3
Pericarditis			*Fundus changes*		
Type	dry	1	Vascular changes		1
	effusion	2	Haemorrhages		2
	haemorrhagic	3	Soft exudates and papilloedema		3
Anaemia			*Visual field*		
Packed cell volume	26%–30%	1	Peripheral defects		2
	20%–25%	2	Central defects		3
	less than 20%	3	*Peptic ulcer*		
Previous transfusions	once	1	Inactive		2
	2–5 times	2	Active		3
	more than 5 times	3	*Colonic ulcers*		
			Bleeding		3
Haemorrhagic tendencies			*Persistent urinary tract infection*		2
Platelet defect		1			
Other defects		3			

[a] Scores represent the mean obtained by separate questioning of 7 consultant nephrologists.

the chance of dialysis. This evaluation is expressed as a score representing the sum of points in favour of dialysis.

By subtracting the points against dialysis, representing the medical limitations, from the points for dialysis, representing the patient's socioeconomic claims, a final score is obtained that is used as the sole criterion for setting priorities. A waiting list is established, and by simple calculation the anticipated date for starting dialytic treatment can be reported to the patient and his treating physician.

At present there is room for 69 patients. If we accept a constant mortality of 30% a year, fewer than 12 of these subjects will be alive by the end of 1980. During this period, the country will have gained 250 man-years at a total cost of about £E 740 000, but we should expect to provide regular dialysis treatment for 369 new patients.

Reduction of the number of cases

At some stage we should be able to stop the endless flow of cases by reducing the number of patients needing dialytic treatment. Preventive measures should eliminate many renal diseases that eventually culminate in terminal renal failure. At least it should be possible, by controlling schistosomiasis, to reduce mortality from genitourinary disease from Egypt's very high level of 193 per million to the corresponding figure of 110 per million in other countries (5). Further preventive measures may subsequently reduce the incidence of other nonschistosomal renal diseases. Improvements in diagnostic and therapeutic tools should be able, in the long run, to cure or control renal disease, and so reduce the number of subjects needing dialytic treatment.

The development of an organized renal transplantation programme at national level will ultimately absorb cases from the dialysis programme, creating a high turnover rate that will ensure dialytic treatment for an increasing fraction of the population without the need for a tremendous increase in facilities.

Optimum use of present facilities

On the other hand, the dialysis service may be expanded even at a very early stage by arranging 2 or more shifts on the same machine each day. Although this may mean doubling the staff, in the long run it will reduce the cost per treatment, besides enabling a larger fraction of the population to be covered. The establishment of new centres could come next, when more nephrologists are available. The cost data already presented strongly suggest that the choice should fall on 5-bed units, in which the cost of dialysis approaches that in 10-bed units with the additional advantage of permitting the dialysis service to be more widely distributed through the country. When large centres are established, a limited number of beds may be devoted to research, and others to paying patients outside the national programme. For evident reasons this can stimulate progress and improvements in facilities.

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RÉSUMÉ

TRAITEMENT DE LONGUE DURÉE PAR HÉMODIALYSE INTERMITTENTE EN EGYPTE

Une étude rétrospective sur les décès par infections génito-urinaires en Egypte durant les dix dernières années a montré que cette cause était à l'origine de 1,1–1,8% de la mortalité totale et que, dans 12,6% des cas, l'indication d'hémodialyse à intervalles réguliers aurait pu être posée, ce qui représente 37,7 cas par million d'habitants. Compte tenu des taux de mortalité et de morbidité chez les sujets traités par hémodialyse, il est apparu que l'application du programme d'hémodialyse régulière à 100 malades représenterait, à l'échelon national, un gain final équivalent à 320 années/malades pour une dépense globale de 1,07–1,7 million de dollars.

L'Egypte ayant des problèmes médicaux beaucoup plus urgents à résoudre, on ne peut escompter que le nombre des installations d'hémodialyse augmentera de façon appréciable avant plusieurs années. Les auteurs suggèrent un système qui permettrait un choix optimal des sujets relevant d'une hémodialyse régulière et garantirait un gain national raisonnable en compensation des dépenses encourues. Le recours à un ordinateur faciliterait l'organisation de l'ensemble du programme, l'établissement de bonnes communications, la répartition des cas entre les différents centres et la tenue des dossiers pour référence ultérieure.

Toutefois, ces mesures ne permettraient pas d'appliquer l'hémodialyse à une fraction importante des cas qui relèvent de cette thérapeutique. Le nombre des malades traités par hémodialyse est fondamentalement cumulatif et il ferait augmenter indéfiniment celui des installations de traitement. Il est proposé d'adopter des mesures préventives destinées à réduire la prévalence des infections rénales au stade terminal. Les auteurs insistent sur la nécessité de lutter contre la schistosomiase qui est largement responsable du fait que, par comparaison à d'autres pays, le taux de mortalité par infections génito-urinaires est excessivement élevé en Egypte.

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