A REPORT OF LOCAL AND REMOTE HOME HAEMODIALYSIS*

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Home dialysis has been carried out in Seattle for 2 years (Curtis et al. 1965; Eschbach et al., 1966) and during this time 12 patients have been trained: 8 men, 3 women and a ten-year-old girl. The ages of the adults range from 22 to 53 years and their occupations include engineer, teacher, student, electrician, physician and housewife. Seven of the patients are resident in Seattle, 5 live 900 miles away in Northern California, where there is no chronic dialysis centre.

Methods

Training is carried out over an 8-week period by a team consisting of a physician, nurse and technician. The patient visits the training centre thrice weekly for dialysis and is accompanied by his spouse or other relative for the last 3 weeks. In the case of the remote patients, their physician must also spend 3-10 days at the centre. All patients use the modified Kiil dialyser which is sterilized with 3% acetic acid.

At the start of the home dialysis programme, treatment was carried out during the day, twice weekly for 8-12 hours. These long dialyses proved intolerable to the patient and his family and prevented full rehabilitation of the patient. We therefore changed to thrice weekly

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Home dialysis patients</th>
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<tbody>
<tr>
<td>Patient</td>
<td>Weight</td>
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<td>---------</td>
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<tr>
<td></td>
<td>kg</td>
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<tr>
<td>CH</td>
<td>61</td>
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<tr>
<td>WM</td>
<td>55</td>
</tr>
<tr>
<td>*EM</td>
<td>71</td>
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<tr>
<td>CC</td>
<td>79</td>
</tr>
<tr>
<td>*OW</td>
<td>57</td>
</tr>
<tr>
<td>*MM</td>
<td>41</td>
</tr>
<tr>
<td>*WB</td>
<td>72</td>
</tr>
<tr>
<td>*JL</td>
<td>54</td>
</tr>
<tr>
<td>*LM</td>
<td>43</td>
</tr>
<tr>
<td>*CM</td>
<td>73</td>
</tr>
<tr>
<td>*PL</td>
<td>68</td>
</tr>
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</table>

* 80 gramme protein diet

* Supported by a grant from the John A. Hartford Foundation.

** Supported by a Training Grant from the U.S. Public Health Service.
dialysis. In order to achieve adequate dialysis with the minimum of inconvenience, equipment
designed to allow safe, unattended overnight dialysis, following the example of Shaldon
(Baillod et al., 1965). Now all but 3 patients have a fully monitored proportioning pump
dialysate supply unit (Eschbach et al., in press; Babb et al., 1964), the remainder have tanks,
one of which is also monitored.

Results

Some data of our adult patients are shown in Table I. Our first patient, C.H., who was
found to have systemic lupus erythematosus 2 months after starting on the programme, has done
quite well. She has treatment only twice a week and is not well dialysed, as shown by her
predialysis plasma BUN and creatinine levels. The 8 patients marked with an asterisk are on
thrice weekly overnight dialysis and are allowed 80 g of protein and up to 2 g of sodium per
day. Their plasma BUN and creatinine levels are well controlled. The values are more
satisfactory than those of the 2 patients W.M. and C.C., who are not on overnight dialysis
and still require protein (40 g) and sodium (0.5 g) restriction. The amount of dialysis required
by each patient appears to be related to the body weight and residual renal function, but
there is considerable individual variation. Blood transfusion requirements are shown and
have not increased with thrice weekly dialysis.

Complications

Complications encountered in the home include partial separation of the cannulas on 3
occasions during dialysis, which was promptly picked up by the arterial monitor, allowing
the patient to clamp the cannula with the loss of only 20 ml. of blood.

Bacteremia accompanied by fever and chills has occurred 4 times and on 3 occasions the
organism cultured was a bacillus species. At the same time, cultures from the membrane pan
and dialysate outflow had heavy growths of this organism. Three per cent acetic acid is not
sporicidal and in environmental studies the bacillus species has been cultured from all the
domestic dialysing areas. We now suggest that patients periodically soak the Kiil boards in
6% formalin in the membrane pan. This is an effective way of sterilizing both the boards and
the pan, and has reduced the bacillus counts.

Some of the early patients have had difficulty adjusting to home dialysis. A feeling of
dependence on the spouse has been a major contributing factor, as with the initial patients
the spouse was trained to take the responsibility of the dialysis procedure. This has created
emotional stress in the home. As first emphasized by Shaldon (Shaldon et al., 1963; Leading
article, Brit. med. J., 1963), self-dialysis is the correct approach to the chronic patient. When
the patient is responsible for his own treatment as is now the case, he is more confident and
achieves a better understanding of his equipment. If things go wrong, he is not in a position
to blame the other member of the family.

There have been no special problems related to the remote patients. Experience over a
period of 8 months has shown that after returning to their home state, the physician is only
required for medical care; the patient and his family are well able to handle the technical
aspects of dialysis. Three recannulations have been performed by a surgeon in California.

The remote patients obtain their own supplies direct from the suppliers and the equipment
is serviced by the manufacturers’ local representative.

The estimated cost of home dialysis is shown in Table II and the yearly total is approxi-
mately half that for centre dialysis. The local patients are supported in part by a grant from
the John A. Hartford Foundation; the remote patients finance all their own treatment.

Conclusion

Home dialysis is an acceptable and practical form of therapy. Apart from being less
expensive than centre dialysis, it has definite advantages. The patient spends more time in the
TABLE II

Cost of home haemodialysis

<table>
<thead>
<tr>
<th>I. Initial costs</th>
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<tbody>
<tr>
<td>A. Equipment</td>
<td>$10,000</td>
</tr>
<tr>
<td>B. House remodeling</td>
<td>1,000±</td>
</tr>
<tr>
<td>C. Training (2 months)</td>
<td>1,800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$12,800</strong></td>
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<table>
<thead>
<tr>
<th>II. Yearly costs</th>
<th></th>
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<tbody>
<tr>
<td>A. Supplies (3 \times week)</td>
<td>$2,650</td>
</tr>
<tr>
<td>B. Cannulations (2)</td>
<td>550</td>
</tr>
<tr>
<td>C. Blood @ $10.50 \times 24</td>
<td>250</td>
</tr>
<tr>
<td>D. Physician costs</td>
<td>200</td>
</tr>
<tr>
<td>E. Laboratory tests</td>
<td>200</td>
</tr>
<tr>
<td>F. Equipment service calls</td>
<td>300</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$4,150</strong></td>
</tr>
<tr>
<td>G. Equipment depreciation (over 5 years)</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$6,150</strong></td>
</tr>
</tbody>
</table>

Total cost per dialysis: $39.40

home and has more freedom in the scheduling of his dialyses, so that the programme can be integrated with a near normal working and social life. The patient is responsible for, and able to perform his own treatment, so that a maximum amount of independence is retained, which we feel is a major element in good psychological adjustment. With thrice weekly overnight dialysis, adequate biochemical control can be obtained, allowing the patient a fuller and more normal diet.

Our experience with the remote patients has shown that private physicians are willing and able to care for these people. With adequate training of the patient, the physician does not need to be an expert in dialysis.

Large numbers of patients will require chronic dialysis treatment and home dialysis provides the means of treating all but the minority who are unsuitable for medical, social or psychological reasons. With the satisfactory results of the remote programme to date, we can envisage the centre taking on a training and consultative role, with the private physician caring directly for the patient.

REFERENCES


DISCUSSION

The Chairman: Thank you very much. I think there will be some comments from the panel on regular home dialysis.

Merrill (Boston): I certainly agree with everything that has been said by the two previous essayists. More than two years ago, we did our first patient, because it was our feeling that the aim of chronic dialysis was to fully rehabilitate an ambulatory patient, and if that were true, his care did not belong, it seemed to me, linked to hospital, particularly an acute hospital even if it were a centre attached. We thought that home dialysis was therefore the answer. Our experience has been similar to the two reported. We have been involved with 14 patients with a little less than 9 patient years. A number of our patients have gone into the transplant programme.

Some of the problems that we have seen have been similar to the ones that have been presented here. The psychological problem certainly is a great one, the relationship to the spouse, and although I agree that psychiatric analysis is not necessary before entering on a programme, it is certainly nice to know, as has been emphasized, something about the marital stability because this may be a major problem.

Our costs, using the Twin-Coil, have been comparable; the initial cost, of course, is a little less, and the yearly cost a little more.

We do not have the good luck with our remote colleagues, that is the physicians who take care of our patients who do not live in Boston. We have one who is almost 2000 miles away, and his problem has been not home dialysis per se but with the physician who takes care of him who actually is mainly interested in nephrology but not dialysis, and he feels he has been a little imposed upon.

I would say a word about the business of unattended or unobserved dialysis which I think can be a two-side problem in the sense that it makes the patient responsible for himself and that it emphasizes the ability to safely dialyse without the necessity for watching every minute; it is obviously of real value. On the other hand, these patients are obviously doing something more than brushing their teeth; they need a cooperative family, they need a good relationship with the family, and they need someone else involved, even if it is only in the next room.

So that I think that, in that sense, it emphasizes the team endeavour and the solidarity which the household must obtain if it is to function well.

I was delighted to hear the last essayist talk about the role of the centre as perhaps a training unit and a centre for satellite units which may teach home dialysis.

We have just instituted with the Shadduck Hospital a dialysis centre which we hope will serve as such a unit and the expansion of home dialysis in Massachusetts, I think, will be greatly benefited thereby.

The Chairman: Thank you, Dr. Merrill. Maybe there is experience of such a method in Europe? Dr. Giovannetti told me he had some experience.

Giovannetti (Pisa): We, in Pisa, have a very short experience, of such treatment. We started to treat patients by home dialysis only a few months ago.

However, I may confirm the results obtained by Dr. Shaldon and I am very satisfied. Particularly I would like to mention the fact that the incidents with complications are much more important in the hospital than at home.
DISCUSSION

The Chairman: Thank you, Dr. Giovannetti. May I ask the following question: who pays for the apparatus which is used by the patients?

Scribner (Seattle): We had a research grant from the Hertford Foundation to try our first seven patients, and beyond that, the patients themselves have paid for the system (the five additional patients). I would add however that among the advantages of home dialysis is the appeal of various agencies of the Government, insurance etc. for the method of financing; in other words, the general pattern has been so far that if we can get these patients set up in business in their homes properly equipped, which is expensive, the running cost can be met by the patient himself or in combination with local fund raising. And this pattern of financing lends itself, at least in the United States, much better to insurance coverage, to bank loans (the Government being a partner with the patient in setting him up in business) than the long high cost of centre type treatment.

This is an additional advantage of home dialysis as far as we are concerned.

Rotellar (Spain): A few moments ago, we spoke of the necessity of money for our programmes.

If you put an artificial kidney at home, you spend the money of the patient, but you use that artificial kidney only twice in the week. For that reason, this artificial kidney is more expensive than one artificial kidney in the hospital.

My other question is this: it was said that there are less complications at home. But are the results of the complications as easy to resolve at home as in the hospital?

For that reason, I think this idea of home dialysis is very interesting as an experiment, but it is more expensive and more dangerous at home. My system is very cheap and I could easily put it at home but I prefer not to, and I am more of the idea that one should put the home in the hospital and not the hospital at home. From the point of view of the psychological atmosphere, it is true that the patient is better at home but instead of putting the atmosphere of the hospital at home, we prefer to put the home atmosphere in the hospital. Later on in this Congress, you will see some slides about that atmosphere.

Shaldon (London): I think your first query is a very reasonable one superficially but in terms of depreciation of equipment and repair and replacement, it is quite clear that equipment used only twice or three times a week is, in fact, economically used because it deteriorates at a slower rate. I think you will find that most hospital centres that operate four nights a week usually cover their beds with more than one Kilil dialyser per bed so that probably the actual number of utilizations of the Kilil, for example, from home to hospital is not that different. And even if it were, the actual capital outlay in terms of the equipment would pay for itself within two years on running costs saving.

As regards the atmosphere, I think this is very important. You must separate the dialysis system in the home from the hospital; it should not pervade the whole home and this is the only reservation I have about the number of times a week one should do home dialysis. There are undoubted advantages in terms of a better diet and possibly even better health but you are instituting an extra-corporal circulation three times a week instead of twice a week; this is a strain on the patient and his relatives; it should not be neglected. But if you isolate that room and do not go into it other than on the two nights you are being treated, this is a perfectly acceptable alternative to death.

This is what I think all of us who have been faced with no room in hospital have tried to do. I do not in any way deny that for the majority of patients, going to a luxury hotel is probably better than having to scrub floors and make their own beds. But the real question is: is home dialysis an acceptable alternative to death, not whether hospital dialysis is preferable.
DISCUSSION

Scribner (Seattle): I would just like to say that first, in answer to the question of equipment utilization and cost, I quite agree with Dr. Shaldon’s analysis of the situation. I would only add that when you just put the cost down in dollars and cents, it is cheaper in the home, the reason of course being that the big cost of dialysis is in the labour involved and not in the equipment.

The question of unattended dialysis, I quite agree with Dr. Merrill’s comments that the procedure should be done in the spirit of the home with people joining in. The only point of unattended dialysis is to permit the dialysis to go on during the night, when the patient is asleep. This is an enormous saving in time and watching and waiting. In my view, as I will stress a little later when I shall give my brief talk, it is the single most important development that’s come along, and I think Dr. Shaldon recognized its importance when he first had the courage to try it.

Finally, in respect to Dr. Shaldon’s comments of twice versus thrice weekly, all I can say is that any patient in our group who has tried thrice weekly dialysis feels so much better and enjoys life so much more that we could not get them to go back to twice weekly if we begged them to!

The patients ultimately are going to settle these questions. We think we have the guidelines, but more and more, in Seattle anyway, the patients are telling the doctors what is right and wrong and not the other way round!

Merrill (Boston): I would like just to make one comment about cost, which is an interesting one and perhaps illustrates the futility of attempting to do large scale dialysis in an acute hospital. That is simply that the patient who is dialysed in hospital is admitted as a hospital patient, we cannot get around that. And the cost to him plus the equipment is reckoned on the total patient cost per day in hospital, so that in essence, although he may be perfectly well and going to work, his patient day is reckoned as one of 400 other patients days, some of whom may be critically ill, and the whole cost is broken down by the number of patients of whom he is only one. Therefore, in the acute hospital, it makes it considerably more expensive for him simply as a matter of bookkeeping for the hospital.

The Chairman: Perhaps in Europe the problem is not the same. Especially in France, the system of social security we have gives the patient quite a lot of money when he is going to the hospital. But if he is treated at home, until now, if there is not another way of giving him money, the expense will be greater for him. That is a question which is very important for us.

Any other question?

Thaysen (Copenhagen): Just one remark. I tried, on the basis of the little talk I am going to give later, to calculate the expense.

In Denmark it will require less than 2% of the total hospital care cost of all patients in the country. And no Government would resist that! They would certainly pay for it.

Secondly, the people who are working in rehabilitation work in our country state that they are willing to spend between 250 and 300,000 Danish crowns: 40 to 50,000 dollars to rehabilitate a man. They think that is a fruitful investment, provided the man can be rehabilitated to do normal work.

So, I do not think it is a question of cost. It is a question of quality, as I said before. And to have this quality, we must start in good centres. Otherwise we get in the wrong direction, the treatment becomes poor, the whole thing bounces back, and the patient starts to complain.

It is not cost, it is quality, nephrology, first of all.