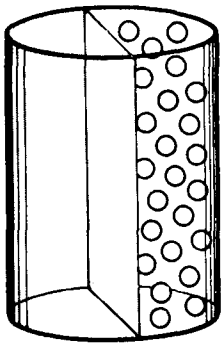
Dialysis Workshop



Conducted by:

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REVIEW OF HEMODIALYSIS FOR NURSES AND DIALYSIS PERSONNEL

The C. V. Mosby Company

Coils: Use and Reuse

Q. *What type or variety of solutions should be used in preparing coils for reuse?*

Most units reusing coils—or the Cordis-Dow hollow fiber kidney—rinse with water, hypochlorite solution, water again, and then fill with formalin for sterilization.

Q. Is the fluid completely removed from the kidney in total volume so that it can be used again?

The *water—hypochlorite—water* sequence should completely remove any residual blood, fibrin or protein deposits from the inside surface of the membrane. The hypochlorite can be left in contact with the membrane only very briefly, or the membrane will be seriously weakened. Some people form more clots or debris than others. Hypochlorite is good for cleaning out such debris, and it is relatively cheap. The formalin provides for sterility before the next use.

Resterilization is effective for usually 3 or 4 (or more) uses of a coil. Dr. Haney at the Portland V.A. Hospital has for several years reused coils, using a Zephiran rinse technic, and has used a single coil up to thirty times. For practical purposes, the initial use of a coil plus two re-uses is quite feasible and economical. There are a number of home patients who routinely get six uses from a coil.

Q. Do you keep the coil dry or wet—letting in no air—when kept in the formalin solution?

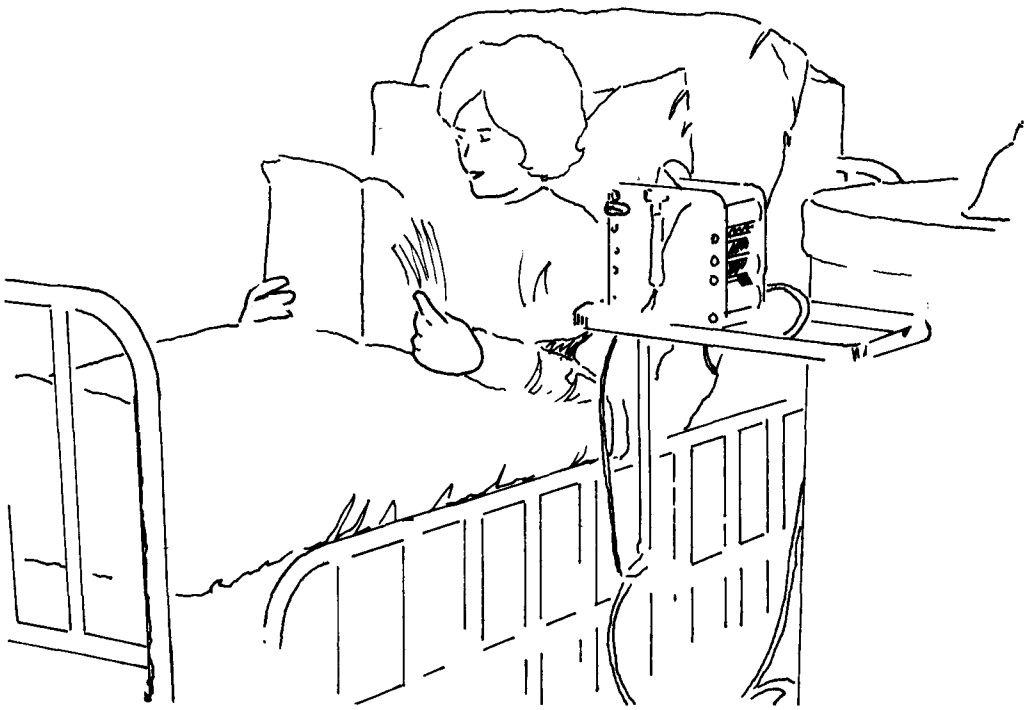
Wet; that is, the entire blood side of the tubing system is filled with formalin. Air is vented from bubble traps, etc. If there is entrapped air in the system, sterilization may not be complete in those areas. On the outside (the dialysis fluid side) our own procedure has been to leave the coil in place in the cannister, plug the stem (inflow) of the cannister with a rubber stopper, and fill the cannister with formalin to the top of the coil.

Some centers, in order to save as much blood as possible during the return of blood to the patient, use an air-saline rinse procedure. This seems to work particularly well with Kiil units. I am not sure that it helps significantly for coils. Removing the cannister-coil unit from the standpipe during blood return and holding it horizontally, or using a rocking motion as it is kept horizontal will yield the maximum of cell recovery. Ours is a home-training center almost exclusively, and we avoid air-rinse procedures since we don't want patients monkeying around with air in the blood circuit when they are at home.

What ever kind of dialyzer unit is employed, for reuse, certain basic steps are followed:

1. Having returned the blood as completely as possible to the patient, some procedure is utilized to clean the inner (blood) surface of the dialyzer. Residual cells, fibrin or other proteinaceous material must be thoroughly removed—otherwise these may cause pyrogenic reactions. Formalin alone cannot be used for this cleansing, since it denatures protein and may actually increase the chance of pyrogen reactions.
2. *After* cleaning, the unit is sterilized and held until the next use. For this, most people find formalin satisfactory.
3. *Before* the next use, the formalin must be completely rinsed away with sterile saline. Glucose test tablets, since they also react to formalin, are used to verify the adequacy of rinsing.

(Presented at the 1971 Conference on Extra-Corporeal Technology)



Other methods of coil cleansing and sterilization:

Some persons have suggested that hypertonic saline solution is an excellent cleansing and sterilizing material. The coil is rinsed with and immersed in, I believe, a 27 per cent salt solution, and stored at room temperature. Such a strong brine solution is bactericidal after several hours. Bowers, several years ago, demonstrated this property of dialysis concentrate.

In fact, one might consider using straight concentrate for the sterilizating solution, although thus far no one has officially reported. A saturated solution of plain salt is probably quite a bit cheaper. Using either salt, or concentrate solution, after rinsing the coil prior to its next use, there would not be the potential danger of carrying formalin into the patient.

In the days of the fiberglass supported coils, everyone had a problem in trying to clean them out. The tubing was much more wrinkled, and the collections of "gunk" were awfully hard to wash away. Zephiran has a good detergent action, and a Zephiram-foam has a good scrubbing effect. However, pseudomonas does survive in Zephiran. With the plastic mesh, pseudomonas grows nicely in this material.

So, while one probably mechanically removes any organisms from the inside of the tubing during the sterile saline rinse prior to reuse, the organisms outside (in the mesh) remain. In this location, they can quickly "seed" a new dialyzing bath. In a total recirculating system (such as the 100 liter tank) this may be important because the rapid multiplication of the organisms leads to changes in pH of the bath very early. This is probably less important in an RSP system, though I would still be concerned. Not many centers use Zephiran alone any more. The same goes for ascetic acid.

Q. What do you think about running an examination of coils rinsed with sterile water?

Pseudomonas is with us all of the time. Commercial sterile water (as supplied by major manufactors) should be OK. But I am dubious of hospital manufactured "sterile" water. Pseudomonas is present on neoprene valve seats in faucets. It drifts in from the air. And a few bugs, once inside the P.V.C. blood lines, will set up housekeeping so that no amount of rinsing will dislodge them. It takes a germicidal agent to erradicate them. Again—7 percent formalin seems the most reliable sterilizing agent.

Q. Have you ever used hydrochloric acid?

Yes—but with more than 15 minutes exposure, it will etch membranes. One of our people did some studies last year on what happens to a membrane when it is reused. He found, in a test cell, that standard Cuprophane membrane had a burst strength of about 8 pounds per square inch. After exposure to hydrochloric acid, the burst strength dropped to 2 pounds per square inch. Upon subsequent exposure to formalin, the strength came back to about 4 lbs. per square inch.

Hypochlorite has a similar, though less dramatic effect on the burst strength, and if the exposure is brief, application of formalin brings it back somewhat closer to normal. But there is a reduction in membrane strength with each exposure to these agents. So with progressive reuse, the likelihood of a coil rupture does increase. One might hope there would be some increase in permeability as a kind of fringe benefit, but we weren't able to show that. There

was no significant change in permeability, either up or down, with the reuse technic we were using.

Question was brought up about the instructor training program at the University of Utah.

(See Fall/1971, Page 19—Editor)

Q. How did you come about this program? How is it progressing?

To answer very honestly, we just got the word on the 7th of July that the proposed program had been approved and will be funded.

We don't have anyone in the program at the moment. We have a lot of planning and organizing to do—curriculum preparation, etc. We would like to get started by September first, starting a couple of students, and adding an additional two on approximately a quarterly basis. Once in full swing, hopefully, there will be 6 to 8 students in various stages of training at any given time.

Those of you who are here are *not* the people we are looking for in this program. But I hope you may be a source for candidates, regardless of your location. We want to establish a program for high school graduates, preferrably with an extra year or two of maturity, either in school or some job which might point them toward dialysis.

We feel that such persons can be taught to be useful, skilled instructors capable of working in home dialysis training units. Home dialysis has to expand, if we are to be able to maintain by hemodialysis all the patients that want transplantation, and who must wait for the proper cadaveric kidney to come along. There aren't enough nurses to allow the rapid expansion necessary, nor should dialysis programs be put in competition with coronary care, I.C.U., or other specialized programs that need R.N.s.

We would like this program to start off with persons without a lot of background—but with an interest in dialysis. They can, we feel, be taught basic physiology, chemistry, pathology, dialysis theory and technic (with various kinds of equipment), then have actual experience in training home patients by working with seasoned home training instructors, so that by the end of a year they are ready to go anywhere and work with nurses and physicians, as qualified instructors.

Q. Where will you have your training center?

Our program is part of the Division of Artificial Organs, at the University of Utah. This Division is headed by Dr. Kolff—the father of the artificial kidney. Teaching will be done in facilities of the Division and in the Home Training Center itself. We will work with the College of Nursing and also the Allied Health Sciences Program of Weber State College.

There is another such program at Louisville, Kentucky. Theirs is, I believe, a two-year program leading to an Associate degree.

Q. How trained should they be? What about degrees?

How much time and money should go into training the brand-new technicians (we prefer to consider them as instructors) is a question for everyone, the trainee, the training institute, the future employer, and ultimately the patient. It is possible to have too highly trained, and too expensive personnel. Then you have priced yourself out of the market.

Hopefully, we can turn out personnel that will enjoy working in dialysis, and that their employers will find useful. As they gain experience, they should be worth more, and receive more pay. Perhaps they will be motivated to seek an associate degree.

Certainly certification of some sort will have to be established. Eventually there will be a registry. Your Society's education and standards committee is working on this, and eventually there will be uniformity of standards across the country. It will take time and effort.

As a final plug—I would mention that Dietz van Dura, our chief training technologist—who has been one of the longest in the business, is actively engaged as a member of your education and standards committee. I don't think Dietz will be satisfied with a training program in which he plays a role, unless the final product is a good one.