



ODE TO
DR. DEMITRIOS
OREOPOULOS

Why ME ?

NEPHROLOGIST-AUSTIN TEXAS-----USA

DR. OREOPOULOS

CANADA

TRANSPLANT FROM GREECE

PERITONEAL DIALYSIS

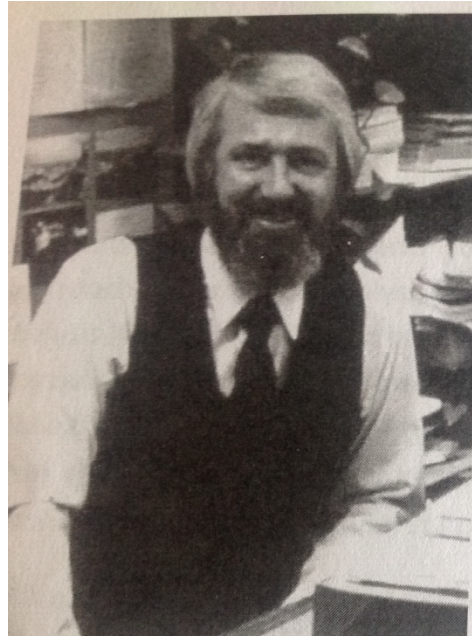
ACUTE KIDNEY FAILURE

INTERMITTENT ABDOMINAL PUNCTURE

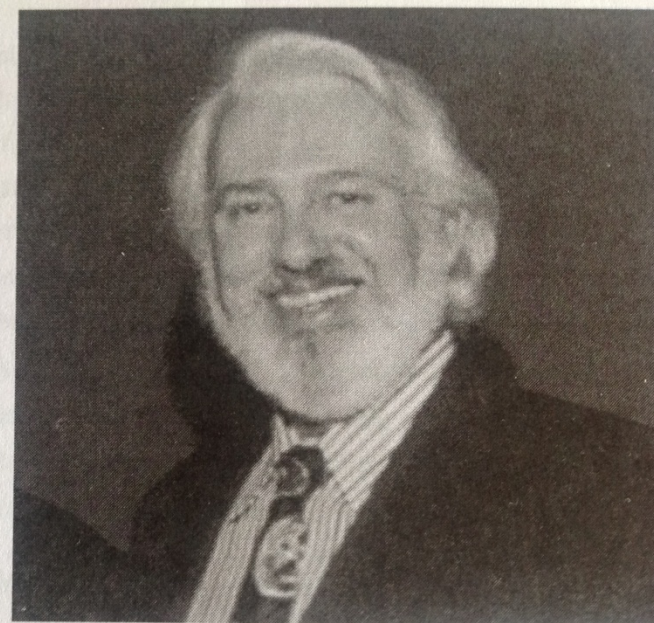
TWO LITER (10 MIN.)-DWELL 30-45 MINUTES-DRAIN(20)

50 HOURS / WEEK-VOLUME 10-20 LITERS

INTERMITTENT



1981



1993

ert ("Bob") Popovich, co-inventor of CAPD, one of the founding members of the

EQUILIBRIUM PERITONEAL DIALYSIS- 1975

-----GLASS BOTTLES—2 LITERS-----

ROBERT P. POPOVICH, Ph.D.

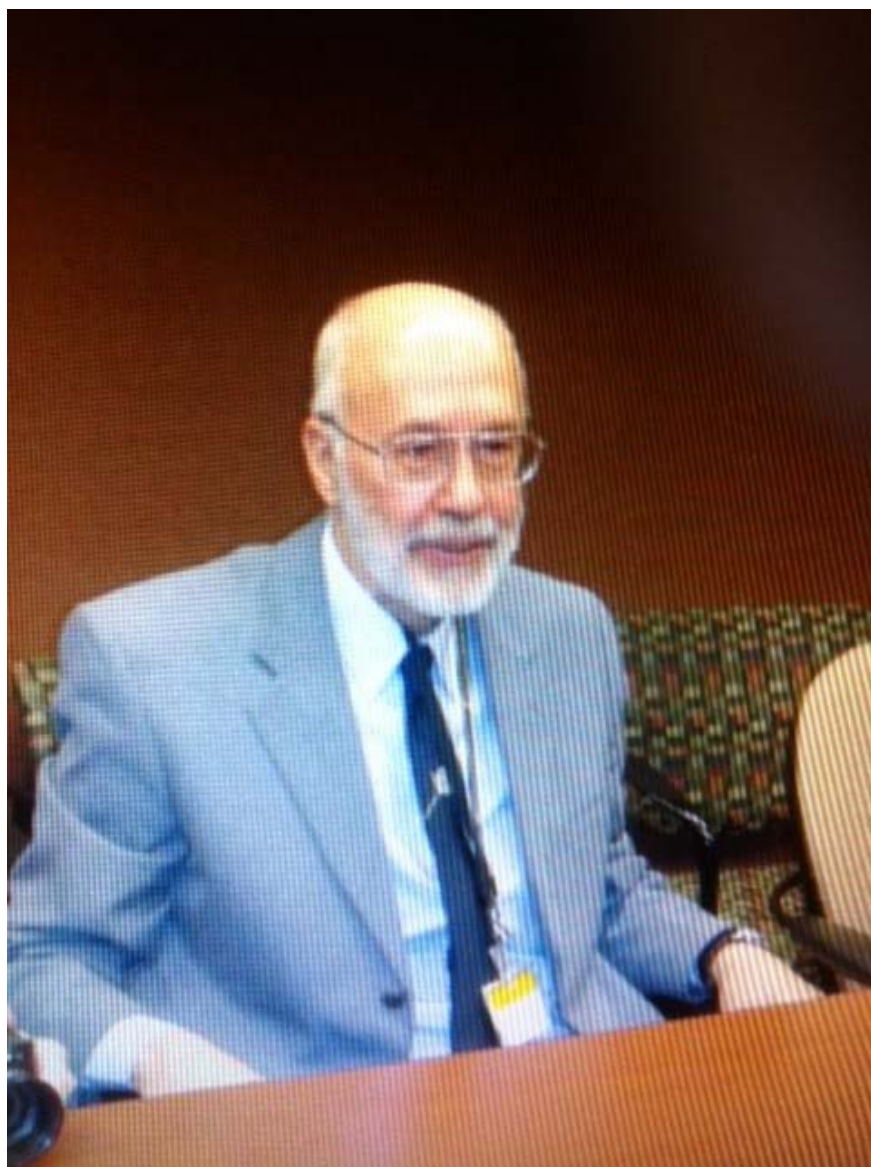
JACK W. MONCRIEF, M.D.

“THAT WON’T WORK’-----“crap”-----infection more than 1 per year per patient—ASAIO ABSREACT—no 1976

KARL D. NOLPH, M.D. U. of MISSOURI-1977

(Collaboration)

Annals of Internal Medicine 1978



Continuous Ambulatory Peritoneal Dialysis

(CAPD)

Jack Rubin, M.D. – Fellow with Dr. Oreopoulos

Dr. Oreopoulos had vast experience with IPD

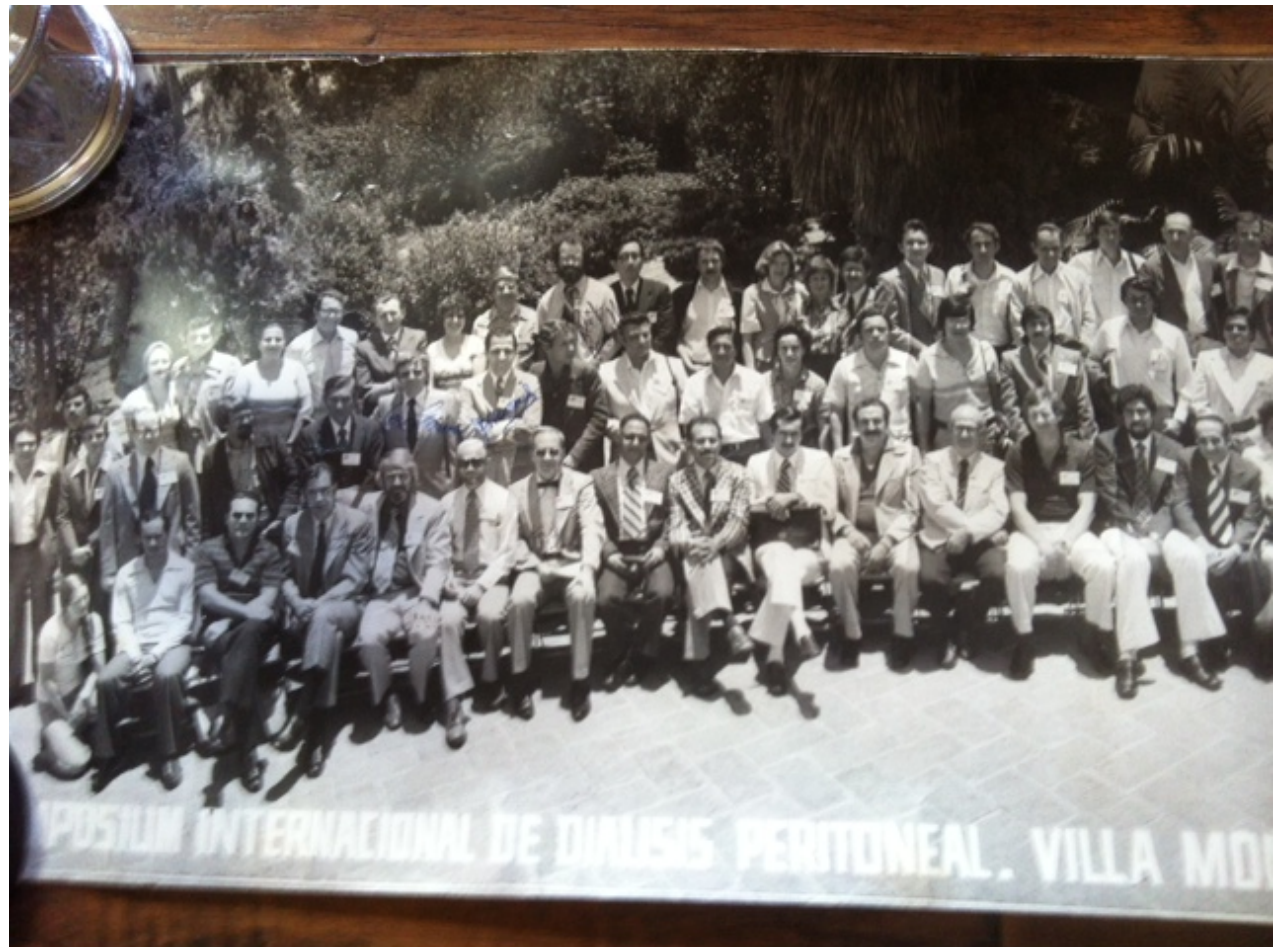
Understood and immediately adapted

LONG DWELL PD to “OREOPOULOS

TECHNIQUE” PLASTIC BAGS

!!!! WOW OCCURED!!! Heard all the way to Texas







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FDA okays plastic bags for home dialysis

BETHESDA, MD.—A threefold drop in the incidence of peritonitis in patients with chronic kidney failure treated by continuous ambulatory peritoneal dialysis can be expected now that FDA has approved plastic containers for dialysate, says Dr. **Jack W. Moncrief** of the Austin Diagnostic Clinic in Texas. At the same time, he predicts the approval is expected to increase markedly the number of patients who will be dialyzed by this method.

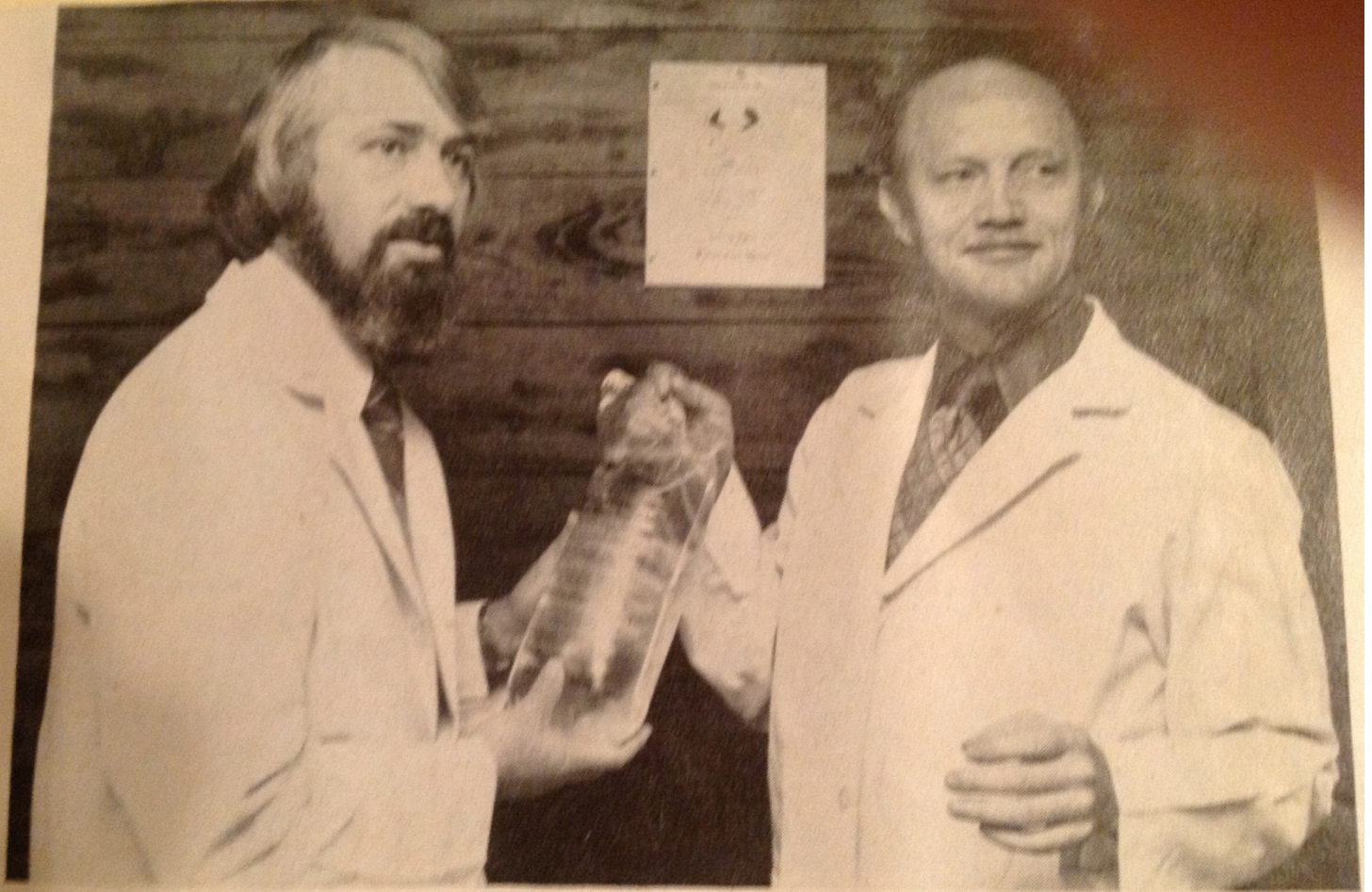
The peritoneal-infection rate is only one case for every eight patient-months in Canada, where plastic containers have been available for several years (MWN, Feb. 6, '78, p. 7). By contrast, Dr. Moncrief points out that the peritonitis rate in the U.S., where glass bottles are used, is about four times as high. The glass bottles have to be disconnected after each exchange, and this results in a higher infection rate.

A recent informal poll indicated that if plastic bags could be used for dialysate, at least 50 centers would consider switching some of their dialysis patients to the ambulatory procedure. ■

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Researchers Dr. Robert Popovich (left) and Dr. Jack Monerlef of Austin, Texas, hold in their hands what may become a widely used alternative to the kidney machine.

the life of an Austin kidney disease patient who had not successfully been the infection problem will be solved.

Continuous Ambulatory Peritoneal Dialysis

By Allen J. Sorrells

With continuous ambulatory peritoneal dialysis (CAPD), the peritoneum serves as a dialysis membrane 24 hours a day, seven days a week. This technique, developed by Jack Moncrief, M.D., and Robert Popovich, Ph.D., at the Austin Diagnostic Clinic in Austin, Texas, gives patients with chronic renal failure new freedom and independence.

Four exchanges of fresh dialysis solution are infused each day. With three of these exchanges the solution remains in the peritoneal cavity for five hours, and the fourth exchange remains overnight (eight to ten hours). The usual exchange times are 7 A.M., 12 noon, 5 P.M., and 10 P.M., but patients may adjust the time depending on individual habits and the physician's consent.

The dialysis solution is now available in two-liter plastic bags, which have been approved by the Food and Drug Administration. Previously, the solution was supplied in bottles and the procedure required complete connection and disconnection of the tubing at the catheter site five times a day.

Now, the patient's catheter is connected to the tubing at all times, and the same tube serves to fill the peritoneal cavity and to drain it. The tubing is changed once a week, using sterile technique. At the time of the change, the patient, using aseptic technique, connects a new two-liter of dialysis solution to the tube for each exchange. It takes approximately six to ten minutes to fill the peritoneal cavity. When it is time to drain, the patient clamps the tubing, the bag, wraps the tubing

around the bag, and places the empty bag and tubing in a cloth pouch. This pouch fits in a shirt or blouse, or it can be strapped to the waist or thigh. Leather pouches are also available that attach to a belt.

At the end of the "dwell-time"—time during which the solution remains in the cavity—five hours in the daytime or ten at night, the patient removes the plastic bag from its pouch, lowers it to the floor, unclamps the tubing, and lets the solution drain. Drainage of the peritoneal cavity usually takes no more than 20 minutes.

After the patient has emptied the peritoneal cavity, again using aseptic technique, he disconnects the bag of used solution, connects a new bag, and fills the peritoneal cavity again. The entire process, from the beginning of drainage of the solution to the end of the filling cycle takes about 30 minutes. Then the person is free to go about his or

her normal activities while the dialysis is proceeding.

Diluted 1.5 percent solution is used (supplied by Travenol Laboratories) for two of the exchanges and Diluted 4.25 percent, a hypertonic solution, is used for the other two exchanges. The hypertonic solution prevents excessive weight gain, and patients have more freedom in choosing their drinking fluids.

Until now, the criteria for selecting patients for CAPD have been the proximity of a dialysis center, the availability of access sites for hemodialysis, and the patient's preferred mode of treatment. In the Texas and Columbia, Missouri Medical centers, most patients placed on CAPD have now been newly diagnosed as having end-stage renal disease. In Toronto, where dialysis solution has been available in plastic bags for several years, Dimitrios Oreopoulos, M.D., has transferred many hemodialysis

and intermittent peritoneal dialysis patients to CAPD.

The availability of the plastic bag has broadened the criteria for patient selection at the Texas and Missouri centers to include patient convenience and the desire to become "machine-free." Most of those patients transferred from intermittent dialysis to CAPD express a need for more independence and control of their lives.

Originally, Moncrief and Popovich based their calculations on a serum urea nitrogen level of 70 mg. percent as an acceptable steady state blood value. However, most patients, after three to six weeks on CAPD, have blood urea nitrogen levels between 40 and 60 mg. percent, and maintain these levels as long as they continue their four exchanges per day. Creatinine levels have been maintained between 5 and 12 mg. percent/l.

The patients have not needed to add potassium to their dialysis solution, and have maintained potassium levels of 3.5 to 5 mEq/l. Occasionally, they have needed an oral potassium supplement(1).

Despite the extensive loss of protein with peritoneal dialysis, patients have maintained low to slightly below normal serum albumin levels, ranging between 3.0 and

3.8 mg. percent. Rarely have patients required salt-poor albumin to correct a low albumin level after an episode of peritonitis(2).

The serum calcium level in these patients has been between 8.5 and 9.0 mg. percent. The serum and ionized phosphorus levels have ranged from 3.5 to 5 mg. percent, and for many patients, the use of phosphorus-binding agents has had to be reduced or discontinued(3).

Most patients on CAPD have little or no dietary restriction. Because of protein and potassium cause of protein and potassium in the dialysate, they are advised to increase their protein intake to 1 Gm./kg. of body weight or more, and potassium intake to 50 mEq./day. The potassium requirement can be satisfied by most commonly used potassium chloride (salt substitute) on prepared foods.

The use of Diluted 4.25 percent solution for two exchanges per day relieves patients of the need to restrict fluids. However, if edema or weight gain occurs, patients are instructed to limit fluids until they return to their ideal weight.

A marked advantage of CAPD is its comparatively low cost. The price of in-center hemodialysis is now approaching \$25,000 per patient per year. The cost of CAPD should not exceed \$8,500 to \$10,000, a minimum saving of \$15,000 per patient per year.

The main problem encountered with CAPD has been recurring peritonitis. In the Texas and Missouri centers, the incidence of peritonitis with the use of dialysis solution in bottles was one in every 10 patient weeks, while Oreopoulos reported one case of peritonitis in every 48 patient weeks using dialysis solution in plastic bags.

Now, since the dialysis solution is available in two-liter bags in the United States the incidence of peritonitis at the Texas Center has been reduced to one in every 35 patient weeks. It appeared that the multiple-catheter and tubing connections and disconnections required with the use of bottles was the principal contributing factor to the high incidence of peritonitis.

Recently, however, some difficulties have been encountered with the connectors currently in use. These problems may have caused approximately 90 percent of the

cases of peritonitis since the dialysis solution became available in plastic bags in October 1978. This was probably due to the way the connectors were adapted to the solution transfer sets used for use in CAPD. However, the Missouri and Texas centers are now working with Travenol Laboratories to develop suitable connectors for CAPD tubing.

As the drainage tubing is removed, it is anticipated that peritonitis

Normal Blood Chemistry Values

albumin	3.5-5.0 Gm./dL
calcium	8.5-10.5 mg./dL
chloride	98-106 mEq./l.
creatinine	men: 0.5-1.2 mg./dL women: 0.3-1.0 mg./dL

blood urea nitrogen	5-20 mg./dL
phosphorus	2.6-4.8 mg./dL
potassium	3.5-5.3 mEq./l.
sodium	135-145 mEq./l.

Widmann, F. K. Clinical Interpretation of Laboratory Tests, 8th ed. Philadelphia, F. A. Davis Co., 1979, pp. 260-263.

It will occur mainly as a result of the patient's failure to follow aseptic technique. The CAPD procedure is simple, but any deviation in technique is potentially dangerous. Therefore, reevaluation of technique is essential to remind patients that frequent problems can occur with shortcuts.

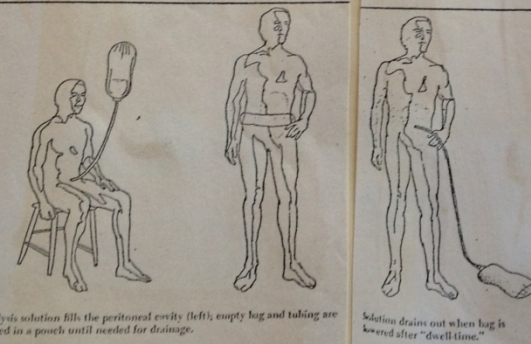
Most patients on CAPD describe an increased sense of well-being, an increase in energy, and improved appetite. Many patients have become more active than they have been in years.

The most profound effect, however, is the freedom that these patients enjoy. They can exchange fluids in a car, a restroom, and in parks, rather than coping with the inconvenience of returning to one place four times a day or being connected to a machine several hours a day, several times a week.

References

1. Popovich, R. P., and others. Continuous ambulatory peritoneal dialysis. *Ann Intern Med* 88:449-456, Apr. 1978.
2. Moncrief, J. W., and others. Additional experience with continuous ambulatory peritoneal dialysis (CAPD). *Trans. Am Soc Artif Intern Organs* 34:475-483, 1978.

American Journal of Nursing/August 1979 1401



Dialysis solution fills the peritoneal cavity (left), empty bag and tubing are placed in a pouch until needed for drainage.

Solution drains out when bag is lowered after "dwelltime."

J. MONCRIEF, M.D., is a nurse consultant, kidney health care program, Texas Department of Health, in Austin. He is working with the Moncrief Popovich Institute on a non-continuing teaching state-approved dialysis technique of CAPD.

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