Utilization of chronic peritoneal dialysis (CPD) continues to decline in the United States. Technique failure remains a key factor in this decline. Center size has been associated with technique failure. Afolalu et al. observed that technique failure rates were higher in units with fewer than 25 patients. We wondered if declining CPD utilization rates are reflective of changes in small or large units. Using the 2000 overall census of individual CPD units in Network #1, New England, between January 1, 2000, and December 31, 2008, we divided the units by size: units with fewer than 25 patients, and units with 25 patients or more.

The CPD patient population increased to 1264 patients in 2008 from 1238 patients in 2000 (a 2% increase). A total of 85 units provided CPD therapy in 2000, increasing to 95 units in 2008. Of the 85 units in 2000, 11 managed 25 patients or more. By 2008, 8 of those 11 units had experienced a drop in CPD census. In 2000, larger units had been caring for 547 patients in total; in 2008, larger units were caring for a total of 546 patients. In 2000, 74 units had fewer than 25 patients, and smaller units were caring for a total of 691 patients. By 2008, smaller units were caring for 718 patients in total.

Our finding that larger units with 25 patients or more experienced an average decline of 34% in CPD census is a major concern. Growth in the total number of smaller units was not associated with overall CPD growth. Further studies are needed to describe the reasons for decline in CPD census noted in most of the larger units.

Key words
Chronic peritoneal dialysis, utilization, technique failure

Introduction
Utilization of chronic peritoneal dialysis (CPD) continues to decline in the United States. In 1991, 15% of prevalent end-stage renal disease (ESRD) patients were maintained on CPD therapy (1). That proportion declined to 8.1% in 2002 and to 7% in 2007 (1). This decline is of particular concern because several studies have noted a feeling on the part of nephrologists that more than 30% of prevalent ESRD patients should be maintained on CPD therapy (2,3). In New England, a survey of nephrologists noted a feeling among nephrologists that 29% of prevalent ESRD patients should be maintained on CPD therapy (2).

Several studies have tried to identify the reasons for decline in CPD utilization (2–4). The reported reasons have included barriers to the initiation of CPD therapy (problems with education about chronic kidney disease, late referrals, patient preference, poor social supports, and inadequate structure and function of CPD centers) and a proliferation of hemodialysis facilities.

Technique failure (patients switching from one form of dialysis therapy to another) remains a problem for patients maintained on CPD therapy. Technique failure is much higher for CPD patients than for hemodialysis patients (5). Currently, between 10% and 15% of prevalent CPD patients transfer to hemodialysis each year. The major causes of technique failure include peritonitis, decreased ultrafiltration capacity, problems achieving adequate clearances, and psychosocial issues (5,6).

Center size has been associated with technique failure. For example, Afolalu et al. noted that technique failure rates are significantly higher in units with fewer than 25 patients than in units with 25 patients or more, and yet mortality rates are similar for those two cohorts (7). Three other studies examined center size and technique failure rates and suggested that the greater experience in larger units may lead to less technique failure (8–10). However, mortality rates in the patient databases examined in those studies varied.

Thus, we wondered if declining CPD utilization rates are reflective of census changes in large and small units.
Materials and methods
Using the censuses of individual CPD units in the Network #1 area (the six New England states) for January 1, 2000, through December 31, 2008, we identified the total number of incident CPD patients in each unit during that period. We also looked at the overall number of patients maintained on hemodialysis during the study period. We did not look at individual unit size for the hemodialysis population.

We divided the individual units by size: units with fewer than 25 CPD patients, and units with 25 CPD patients or more. The 2000 census data specific to the facilities were then used to place patients into two groups by the size of the unit caring for them.

Results
In the Network #1 area, the CPD patient population increased to 1264 patients in 2008 from 1238 patients in 2000 (a 2% increase). The hemodialysis patient population increased to 10,688 patients in 2008 from 8893 patients in 2000 (a 17% increase). The overall percentage of patients maintained on CPD therapy decreased from 12.2% to 10.6% during this period.

A total of 85 units provided CPD therapy in 2000, increasing to 95 units in 2008. Of the 85 units in 2000, 11 managed 25 patients or more. Those 11 units had been caring for 547 patients in 2000; in 2008, they were caring for 546 patients. Eight of the 11 units with 25 patients or more in 2000 experienced a decline in CPD patient census in 2008. The average decline was 34% (range: 1% – 70%). The other 3 units experienced growth of 19% – 30%.

In 2000, 74 of the 85 CPD units had fewer than 25 patients. These smaller units were maintaining 691 patients on CPD therapy in 2000. In 2008, the overall patient census increased to 718 patients, and 10 new units were offering CPD therapy. In 2008, the number of patients in these units was minimal: all units had fewer than 25 patients. The increase in the total number of CPD patients in the smaller units by 2008 was mainly a result of the increase in the number of units providing CPD therapy, because only 3 of the units caring for fewer than 25 patients in 2000 were caring for 25 patients or more by 2008.

Discussion
The decline in CPD utilization in recent years in the United States is disturbing. The finding in the present study that larger units (those in the Network #1 area with 25 patients or more) experienced an average decline of 34% in CPD patient census is a major concern.

The growth in the number of smaller units in the present study was not associated with overall CPD growth. Some experts have noted that it is difficult to establish an effective CPD program if the census remains low (11).

It is also important to note that, compared with patients in larger units, patients in smaller units have been reported to have worse outcomes, including higher technique failure rates and higher peritonitis rates. For example, Afolalu et al. noted that, in the Network #1 area, technique failure—but not mortality—was higher for units with fewer than 25 patients than for larger units (7). Those authors noted that technique failure rates at 1 and 2 years of CPD therapy were significantly higher for centers with fewer than 25 patients than for centers with 25 patients or more (odds ratio: 1.35; \( p = 0.03 \)). Likewise, Huisman et al., using the Netherlands dialysis database, noted a correlation between mean annual technique failure rate and unit size, with units managing 20 patients having a 1.68 relative risk of technique failure (8). Using the Baxter Healthcare database, Guo et al. (10) found that, compared with larger centers, centers with fewer than 20 patients had a higher technique failure rate (hazard ratio: 1.130; \( p < 0.0001 \)). Thus, a decline in CPD utilization in larger units and growth in the number of smaller units may represent a significant concern for this dialysis population.

The reasons for the decline in CPD census seen in most larger CPD units needs to be further examined. Whether this decline reflects the opening of new, smaller CPD units in nearby locations or structural problems in larger CPD units should be investigated.

The hemodialysis population in the six New England states increased and the percentage of ESRD patients maintained on CPD declined during the period under study. This situation raises two questions:

- To what extent does the decline in CPD utilization reflect a lack of chronic kidney disease education and fewer referrals to CPD facilities?
- To what extent does it reflect poorer outcomes associated with the growth of smaller facilities?

Further studies are necessary to understand the variety of factors affecting success and failure during CPD therapy.
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