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Abstract
Background and objectives Neutral-pH, low–glucose degradation products solutions were developed in an attempt to lessen the adverse effects of conventional peritoneal dialysis solutions. A systematic review was performed evaluating the effect of these solutions on residual renal function, urine volume, peritoneal ultrafiltration, and peritoneal small-solute transport (dialysate to plasma creatinine ratio) over time.

Design, setting, participants, & measurements Multiple electronic databases were searched from January of 1995 to January of 2013. Randomized trials reporting on any of four prespecified outcomes were selected by consensus among multiple reviewers.

Results Eleven trials of 643 patients were included. Trials were generally of poor quality. The meta-analysis was performed using a random effects model. The use of neutral-pH, low-glucose degradation products solutions resulted in better preserved residual renal function at various study durations, including >1 year (combined analysis: 11 studies; 643 patients; standardized mean difference =0.17 ml/min; 95% confidence interval, 0.01 to 0.32), and greater urine volumes (eight studies; 598 patients; mean difference =128 ml/d; 95% confidence interval, 58 to 198). There was no significant difference in peritoneal ultrafiltration (six studies; 571 patients; mean difference = −110; 95% confidence interval, −312 to 91) or dialysate to plasma creatinine ratio (six studies; 432 patients; mean difference =0.03; 95% confidence interval, 0.00 to 0.06).

Conclusions The use of neutral-pH, low–glucose degradation products solutions results in better preservation of residual renal function and greater urine volumes. The effect on residual renal function occurred early and persisted beyond 12 months. Additional studies are required to evaluate the use of neutral-pH, low–glucose degradation products solutions on hard clinical outcomes.


Introduction
Residual renal function (RRF) is a strong predictor of mortality in patients on peritoneal dialysis (PD) (1,2). Conventional PD solutions contain a high concentration of glucose, and as a result of the heat sterilization process, glucose degradation products (GDPs) are formed. The systemic effects of GDPs and their resultant advanced glycation end products (AGEs) include induction of renal tubular apoptosis and progression of glomerulosclerosis and diabetic nephropathy (3,4). Local exposure of the peritoneal membrane to GDPs and AGEs results in reduced growth and viability of mesothelial cells and the secretion of growth factors and proinflammatory cytokines. These are thought to have a key role in the progressive peritoneal membrane injury through increased fibrosis, vascular permeability, and vascular proliferation observed in patients on long-term PD (5–8).

This led to the hypothesis that a low-GDP solution could potentially result in less damage to the peritoneal membrane and improved preservation of RRF over conventional solutions.

Thus far, the evidence to support the use of neutral–pH, low-GDP solutions (e.g., Balance and Physioneal) is conflicting. Some studies have shown preservation of RRF, whereas others have not. The mechanisms by which these biocompatible solutions may positively affect RRF have not been clearly delineated.

We conducted a systematic review of randomized, controlled trials (RCTs) in patients on PD comparing the use of neutral-pH, low-GDP solutions with the use of conventional PD solutions and specifically addressed differences in four key measurements: RRF, ultrafiltration (UF), urine volume, and dialysate to plasma creatinine ratio (D/P Cr). Our aim was to determine how treatment with these solutions
would affect these outcomes across various durations of treatment.

Materials and Methods

Data Sources and Searches

A computerized literature search was performed using multiple electronic databases, including MEDLINE, Embase, Science Citation Index Expanded, New Conference Proceedings Citation Index, BIOSIS Preview, and SCOPUS, from their inception to January of 2013. The search terms included PD, glucose degradation, minimal GDP, low GDP, biocompatible, bicarbonate, lactate, pH-neutral solutions, physiologic pH solutions, neutral dialysate, Balance, and Physioneal. All RCTs, quasi-RCTs (studies in which the randomization was by a predictable method), and randomized crossover studies (first period only) in peer-reviewed journals from 1995 onwards were evaluated. Reference lists of the retrieved articles as well as review articles were searched to identify other eligible studies, and experts in the field were consulted to ensure that no relevant study was missed. We restricted our analysis to English-language studies that had a sample size >10 patients. There was no restriction on duration of follow-up. Patients included those on incident and prevalent home PD (using continuous ambulatory PD or ambulatory PD) >18 years of age.

Patients must have been treated with either a neutral-pH, low-GDP or conventional PD solution. The study solutions were (1) neutral pH, low in GDPs, and lactate buffered (e.g., Balance or Gambrosol Trio), (2) neutral pH, low in GDPs, and bicarbonate buffered (e.g., Bicavera), and (3) neutral pH, low in GDPs, and bicarbonate/lactate buffer mix (e.g., Physioneal). Trials using amino acid, glucose polymer, or a combination of solutions were not included. The primary outcome variables were RRF (milliliters per minute calculated using the arithmetic mean of creatinine and urea clearances), UF (milliliters per day), urine volume (milliliters per day), and 4-hour D/P Cr.

Two independent reviewers (S.Y. and A.M.A.A.) screened all titles, abstracts, and full studies for inclusion in the review. Disagreements at any stage were resolved by a third reviewer (A.K.J.). If an author published interim results or different outcomes for the same patient group in multiple publications, we grouped them together as one single study. All studies that did not fulfill the inclusion

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**Figure 1.** Study flow diagram indicating the number of citations retrieved by individual searches, the final number of included studies, and the reasons for exclusion. RCT, randomized, controlled trial.
criteria were excluded, and their reason for exclusion was documented.

**Study Selection, Data Extraction, Quality Assessment, and Data Synthesis**

Data abstraction was done independently by both S.Y. and A.M.A.A. For missing data, study authors were contacted. From the selected studies, we extracted the following information: author names, study date, trial design (e.g., RCT or cross-over design), duration of follow-up, number of patients in each treatment group at baseline and the end of the study, specific neutral-pH, low-GDP or conventional PD solution used, and all data pertaining to our outcome variables. We divided the duration of treatment into the following groups: ≤6, 6–12, and >12 months. For the meta-analysis, we used Review Manager (RevMan), Version 5.2 (The Nordic Cochrane Centre, The Cochrane Collaboration, 2011). To assess risk of bias, we used the Cochrane Collaboration tool for assessing risk of bias (9). It addresses seven domains, including random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other bias. Each study was assigned either low risk, high risk or unclear risk in each of seven domains. If a sufficient number of trials measured the same outcome, funnel plots were created to assess the risk of publication bias. RRF as a continuous variable was pooled to calculate the inverse variance standardized mean difference (SMD), including 95% confidence intervals (95% CIs). For the remaining continuous variables (UF, urine volume, and D/P Cr), we calculated the mean difference (MD), including 95% CIs. Heterogeneity was analyzed using a chi-squared test on $N^2$ degrees of freedom, with an $\alpha$ of 0.05 used for statistical significance, and the $I^2$ test. The $I^2$ values of 25%, 50%, and 75% correspond to low, medium, and high levels of heterogeneity (10). A random effects model, which is generally considered to be more conservative, was used for data analysis.

**Results**

**Trial Flow**

The electronic search of all databases yielded 177 references. Two reviewers independently screened references on the basis of the title and abstract, from which 161 studies were selected for full-text review. Eleven studies were included in the final analysis (11–22) (Figure 1).

**Description of Studies**

Trials were published between 2005 and 2013. The neutral-pH, low-GDP PD solution used in 11 studies was predominantly Balance (72%); eight of 11 studies included patients on incident PD. The studies were, on average, of small sample size, ranging from 26 to 185 patients. Study duration ranged from 3 to 30 months. Additional details of the included studies can be found in Table 1.

**Risk of Bias in Included Studies**

Methods of randomization, blinding, and allocation concealment were not generally reported for most of the included trials, making it difficult to extrapolate the true risk of bias; three studies (27%) specified appropriate methods for randomization, and allocation concealment was adequate in only two of 11 studies (18%). Blinding was present in only one trial (7%). The risk of bias summary of the included studies and the risk of bias graph are shown in Figure 2 and Supplemental Figure 1, respectively. There

### Table 1. Characteristics of included trials comparing neutral-pH, low-glucose degradation product with conventional peritoneal dialysis solution

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Study Design</th>
<th>Sample Size</th>
<th>I/P</th>
<th>Duration (mo)</th>
<th>Neutral-pH, Low-GDP Solution</th>
<th>Conventional Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bajo et al. (11)</td>
<td>2011</td>
<td>Quasi-RCT</td>
<td>33</td>
<td>I</td>
<td>24</td>
<td>Balance</td>
<td>Staysafe</td>
</tr>
<tr>
<td>Cho et al. (12)</td>
<td>2013</td>
<td>RCT</td>
<td>79</td>
<td>I</td>
<td>12</td>
<td>Balance</td>
<td>Staysafe</td>
</tr>
<tr>
<td>Choi et al. (13)</td>
<td>2008</td>
<td>RCT</td>
<td>104</td>
<td>P</td>
<td>12</td>
<td>Balance</td>
<td>Dianeal</td>
</tr>
<tr>
<td>Fernández-Perpén et al. (14)</td>
<td>2012</td>
<td>RCT</td>
<td>31</td>
<td>I</td>
<td>24</td>
<td>Bicavera</td>
<td>Staysafe</td>
</tr>
<tr>
<td>Kim et al. (17)</td>
<td>2009</td>
<td>RCT</td>
<td>91</td>
<td>I</td>
<td>12</td>
<td>Balance</td>
<td>Staysafe</td>
</tr>
<tr>
<td>Kim et al. (18)</td>
<td>2003</td>
<td>RCT</td>
<td>26</td>
<td>I</td>
<td>12</td>
<td>Balance</td>
<td>Staysafe</td>
</tr>
<tr>
<td>balANZ Trial (15,16)</td>
<td>2012</td>
<td>RCT</td>
<td>185</td>
<td>I</td>
<td>24</td>
<td>Balance</td>
<td>Staysafe</td>
</tr>
<tr>
<td>Lai et al. (19)</td>
<td>2012</td>
<td>Quasi-RCT</td>
<td>125</td>
<td>P</td>
<td>30</td>
<td>Gambrosol trio, Physioneal, Balance</td>
<td>Dianeal, Andy-Disc</td>
</tr>
<tr>
<td>Park et al. (20)</td>
<td>2012</td>
<td>RCT</td>
<td>146</td>
<td>I</td>
<td>12</td>
<td>Balance</td>
<td>Staysafe</td>
</tr>
<tr>
<td>Szeto et al. (21)</td>
<td>2007</td>
<td>RCT</td>
<td>50</td>
<td>I</td>
<td>12</td>
<td>Balance</td>
<td>Staysafe</td>
</tr>
<tr>
<td>Weiss et al. (22)</td>
<td>2009</td>
<td>RXCT</td>
<td>54</td>
<td>P</td>
<td>3</td>
<td>Purely bicarbonate buffered$^a$</td>
<td>Staysafe</td>
</tr>
</tbody>
</table>

balANZ, Balance in Australian and New Zealand Peritoneal Dialysis Patients; RCT, randomized, controlled trial; RXCT, randomized cross-over design; I, incident; P, prevalent; GDP, glucose degradation product.

$^a$Manufactured by Fresenius Medical Care.
were not sufficient numbers of studies to evaluate the presence of publication bias.

Effects of Interventions

**RRF.** Eleven studies with 643 patients reported on this outcome (Table 2). The follow-up period for these studies to assess RRF ranged from 3 to 30 months. When studies of all durations of follow-up were combined into one analysis, total daily peritoneal UF was not significantly different in patients treated with neutral-pH, low-GDP versus conventional PD solutions (seven studies; 571 patients; MD=−110 ml/d; 95% CI, −312 to 91; I²=75%). When evaluated by duration of treatment, all treatment durations showed no significant benefit with the use of neutral-pH, low-GDP PD solutions: ≤6 (five studies; 209 patients; MD=−182 ml/d; 95% CI, −477 to 114; I²=83%), 6–12 (six studies; 484 patients; MD=−135 ml/d; 95% CI, −350 to 80; I²=77%), and >12 months (two studies; 215 patients; MD=−106 ml/d; 95% CI, −443 to 232; I²=57%) (Figure 4).

**Urine Volume.** Eight studies including 598 patients reported on this outcome. The follow-up period ranged from 3 to 30 months. The pooled analysis of all studies showed significantly greater total daily urine volume with the use of neutral-pH, low-GDP PD solutions (eight studies; 598 patients; MD=128 ml/d; 95% CI, 58 to 198; I²=0%). When evaluated by duration of treatment, neutral-pH, low-GDP PD solutions resulted in greater urine volume; however, this was only significant after 6 months of treatment: ≤6 (five studies; 409 patients; MD=143 ml/d; 95% CI, −70 to 357; I²=77%), 6–12 (six studies; 484 patients; MD=141 ml/d; 95% CI, 43 to 239; I²=30%), and >12 months (two studies; 215 patients; MD=193 ml/d; 95% CI, 9 to 378; I²=0%) (Figure 5).

**Peritoneal Solute Transport Rate.** Six studies of 432 patients reported on this outcome. The follow-up period ranged from 6 to 30 months. Overall, the pooled analysis showed that the D/P Cr at 4 hours was no different in patients treated with neutral-pH, low-GDP PD solutions compared with conventional solutions (six studies; 432 patients; MD=0.03; 95% CI, 0.00 to 0.06; I²=57%). When D/P Cr was evaluated by duration of treatment, treatment with low-GDP, neutral-pH solutions resulted in a higher D/P Cr at ≤6 months of treatment (three studies; 291 patients; MD=0.04; 95% CI, 0.02 to 0.06; I²=0%); however, it was not significantly different beyond this time: 6–12 (five studies; 349 patients; MD=0.02; 95% CI, −0.01 to 0.05; I²=55%) and >12 months of treatment (two studies; 209 patients; MD=0.03; 95% CI, −0.03 to 0.09; I²=90%) (Supplemental Figure 2).

Discussion

We conducted a systematic review of the effect of neutral-pH, low-GDP versus conventional PD solutions. The effects of these solutions on RRF, urine volume, peritoneal UF, and small-solute transport (D/P Cr) were measured. In these analyses, neutral-pH, low-GDP solutions resulted in significantly greater urine volume beyond 6 months and improved preservation of RRF throughout all durations of treatment. Peritoneal UF and peritoneal small-solute transport were not significantly different with the use of these solutions.

There have been two published meta-analyses comparing neutral-pH, low-GDP and conventional solutions by Cho et al. (23,24) and Seo et al. (25). Both have suggested
that prolonged treatment (i.e., >12 months) with neutral-pH, low-GDP solutions resulted in improved RRF. However, our analysis reveals the novel finding that RRF is improved even earlier. After just 6 months of treatment with neutral-pH, low-GDP solutions, we found greater preservation of RRF compared with that in patients treated with conventional solutions. The effect on RRF continued throughout to >12 months of treatment. The differences between our results and those of the prior published meta-analyses are likely caused by study selection. We included two large trials in our analysis that were not included in the meta-analysis by Cho et al. (23,24) (studies by Cho et al. [12] and Park et al. [20]). These studies (12,20) were published after the meta-analysis by Cho et al. (23,24) was published and added over 200 patients. Additionally, we excluded two trials that did not meet our inclusion criteria. First, a study by Haas et al. (26) was of pediatric patients, and thus, it was excluded on the basis of our inclusion criteria. Second, a randomized study conducted by Fan et al. (27) was not included, because it reported only baseline measurements and the change in these measurements during the study period rather than final values. This study did report 3-month data; however, the number of patients in each study arm at that point in time was not disclosed. Our meta-analysis differed from the analysis by Seo et al. (25) in that we included two trials (studies by Fernández-Perpén et al. [14] and Weiss et al. [22]) not in their analysis. Also, we excluded two trials that the analysis by Seo et al. (25) included; we excluded the study by Fan et al. (27) for the reasons explained above, and also, we excluded the study by Williams et al. (28) because of the methods of reporting data. When we consider the results of the Balance in Australian and New Zealand Peritoneal Dialysis Patients (balANZ) Trial (15,16), perhaps the best executed RCT included in our analyses, our findings with respect to RRF seem to be similar, because Johnson et al. (15,16) also showed a better RRF, particularly during the first 12 months (15,16).

It is unclear why the use of neutral-pH, low-GDP solutions would result in improved RRF. Some have postulated that the reduced GDP content and the resultant lower levels of AGES could prevent damage to the kidneys and thus, preserve RRF (4). Another hypothesis is that these solutions cause less peritoneal UF, leading to increased urine volume and improved RRF. The mechanism by which these solutions would cause reduced UF could potentially be through increased peritoneal small-solute transport (D/P Cr). A rise in D/P Cr during treatment with neutral-pH, low-GDP solutions has been described previously (28), but the exact mechanism is not understood. Animal studies comparing conventional and neutral-pH, low-GDP PD solutions show that, in contrast to conventional solutions, these solutions do not provoke increases in peritoneal blood flow through inflammation and neoangiogenesis. Alternatively, administration of neutral-pH, low-GDP fluids may influence local peritoneal membrane function by increasing production of vasoactive substances, such as vascular endothelial growth factor and nitric oxide (29). Regardless of the mechanism, an increase in D/P Cr would lead to a faster loss of the osmolar gradient and subsequently, reduced UF (Supplemental Figure 3). Davies (30) and Blake (31) have previously suggested this theory in reviews of biocompatible PD solutions.

In support of this theory, we note that the summary estimates of decrease in peritoneal UF and rise in urine volume were similar (110 and 128 ml/d, respectively). However, the results for peritoneal UF were not statistically significant at any time point, meaning that we cannot

### Table 2. Summary of findings: Neutral-pH, low–glucose degradation product versus conventional solutions for peritoneal dialysis

<table>
<thead>
<tr>
<th>Outcome/Duration of Follow-Up (mo)</th>
<th>No. of Studies (No. of Participants)</th>
<th>Relative Effect</th>
<th>95% CI</th>
<th>Quality of the Evidence (Grade)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Residual renal function (ml/min)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>11 (643)</td>
<td>SMD=0.17</td>
<td>0.01 to 0.32</td>
<td>Moderate</td>
</tr>
<tr>
<td>≤6 mo</td>
<td>6 (390)</td>
<td>SMD=0.45</td>
<td>0.11 to 0.79</td>
<td>Moderate</td>
</tr>
<tr>
<td>6–12 mo</td>
<td>9 (567)</td>
<td>SMD=0.24</td>
<td>0.08 to 0.41</td>
<td>Moderate</td>
</tr>
<tr>
<td>&gt;12 mo</td>
<td>5 (281)</td>
<td>SMD=0.24</td>
<td>0.01 to 0.48</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Ultrafiltration (ml/d)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>7 (573)</td>
<td>MD=−110</td>
<td>−312 to 91</td>
<td>Moderate</td>
</tr>
<tr>
<td>≤6 mo</td>
<td>5 (409)</td>
<td>MD=−182</td>
<td>−477 to 114</td>
<td>Moderate</td>
</tr>
<tr>
<td>6–12 mo</td>
<td>6 (484)</td>
<td>MD=−135</td>
<td>−350 to 80</td>
<td>Moderate</td>
</tr>
<tr>
<td>&gt;12 mo</td>
<td>2 (215)</td>
<td>MD=−106</td>
<td>−443 to 232</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Urine volume (ml/d)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>8 (598)</td>
<td>MD=128</td>
<td>58 to 198</td>
<td>Moderate</td>
</tr>
<tr>
<td>≤6 mo</td>
<td>5 (409)</td>
<td>MD=143</td>
<td>−70 to 357</td>
<td>Moderate</td>
</tr>
<tr>
<td>6–12 mo</td>
<td>6 (484)</td>
<td>MD=141</td>
<td>43 to 239</td>
<td>Moderate</td>
</tr>
<tr>
<td>&gt;12 mo</td>
<td>2 (215)</td>
<td>MD=193</td>
<td>9 to 378</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>4-h dialysate to plasma creatinine ratio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pooled</td>
<td>6 (432)</td>
<td>MD=0.03</td>
<td>0.00 to 0.06</td>
<td>Moderate</td>
</tr>
<tr>
<td>≤6 mo</td>
<td>3 (291)</td>
<td>MD=0.04</td>
<td>0.02 to 0.06</td>
<td>Moderate</td>
</tr>
<tr>
<td>6–12 mo</td>
<td>5 (349)</td>
<td>MD=0.02</td>
<td>−0.01 to 0.05</td>
<td>Moderate</td>
</tr>
<tr>
<td>&gt;12 mo</td>
<td>2 (209)</td>
<td>MD=0.03</td>
<td>−0.03 to 0.09</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

SMD, standardized mean difference; MD, mean difference; 95% CI, 95% confidence interval.
exclude the possibility that there would, in truth, be a rise in peritoneal UF. The analysis of UF suffered from a high degree of statistical heterogeneity and was further hindered by the infrequent reporting of icodextrin use or peritoneal glucose exposure. Furthermore, although our pooled analysis of final D/P Cr showed a trend toward an increase ($P=0.05$), this pooled analysis also suffered from a high degree of statistical heterogeneity. When evaluated by duration of treatment, the D/P Cr initially increased during the first 6 months of treatment (without any heterogeneity), but beyond 6 months, there was no significant difference. This does not coincide with the consistent improvement in RRF over time and undermines the argument that these solutions may potentially cause improved RRF through an increase in D/P Cr and subsequently, reduced UF. Therefore, on the basis of our results, there is no evidence to prove or refute the proposed theory (Supplemental Figure 3).

This review has a number of strengths. We designed a comprehensive search strategy in the first phase of reference screening. The search of multiple major databases and reference lists combined with the use of very few inclusion/exclusion criteria increased our confidence in the identification of all relevant trials. We included only RCTs or quasi-RCTs as described above. Only the data from the first phase of the randomized cross-over studies were included for quantitative analysis to minimize the risk of

Figure 3. Effect of neutral-pH, low–glucose degradation product (GDP) peritoneal dialysis solutions on residual renal function (RRF). (A) Pooled analysis of all study durations. (B) Up to and including 6 months duration of treatment. (C) Beyond 6 months and up to and including 12 months duration of treatment. (D) Beyond 12 months duration of treatment. 95% CI, 95% confidence interval; balANZ, Balance in Australian and New Zealand Peritoneal Dialysis Patients; df, degree of freedom.
the carryover effect and potential introduction of bias of the time-dependent variables. Data extraction, data analysis, and method quality assessment were performed by two independent reviewers, and any conflicts were resolved with an additional reviewer.

We acknowledge several limitations to the body of evidence and therefore, our systematic review. Our review pooled data from low- to average-quality studies. There were methodological flaws to many of the trials, and this may have led to inconsistencies in the results observed. Trial design, methods of randomization, allocation concealment, and blinding were frequently not described. Studies were of small size and experienced high dropout rates. There exists the possibility of publication bias, because an insufficient number of trials was present to create a funnel plot. In nearly all instances, it was unclear whether the investigators used an intention to treat method when analyzing the data. Information regarding volume status (e.g., weight, BP, and edema) was not reported consistently. Most studies did not specify how they measured UF and did not disclose the use of icodextrin. Lastly, differences in glucose prescription between the two treatment groups could not be identified.

There are other limitations to consider when reviewing these data. A high degree of statistical heterogeneity was identified for UF and peritoneal small-solute transport throughout all time points. This could be attributed to the use of different low-GDP solutions containing variable quantities of GDPs (32), varying trial durations, and the inclusion of both patients on incident PD and patients on prevalent PD. Ideally, we would have compared the longitudinal change in peritoneal small-solute transport rate with both solution types, which was done in the balANZ Trial. Unfortunately, other than the balANZ Trial, there were no studies that presented data on the trend of D/P Cr over time. This would be an important finding, because we know from observational studies that a higher D/P Cr is a risk factor for technique failure. There is also the possibility that those patients who became anuric during the study period skewed results against solutions that tend to preserve RRF for longer times. Ideally, we would have liked to capture a time to anuria outcome, but many studies did not assess this outcome.

In conclusion, these analyses show that neutral-pH, low–glucose degradation product (GDP) peritoneal dialysis solutions on 24-hour peritoneal ultrafiltration (milliliters per day). (A) Pooled analysis of all study durations. (B) Up to and including 6 months duration of treatment. (C) Twelve months duration of treatment. (D) Beyond 12 months duration of treatment. 95% CI, 95% confidence interval; balANZ, Balance in Australian and New Zealand Peritoneal Dialysis Patients; df, degree of freedom.

Figure 4. | Effect of neutral-pH, low–glucose degradation product (GDP) peritoneal dialysis solutions on 24-hour peritoneal ultrafiltration (milliliters per day). (A) Pooled analysis of all study durations. (B) Up to and including 6 months duration of treatment. (C) Twelve months duration of treatment. (D) Beyond 12 months duration of treatment. 95% CI, 95% confidence interval; balANZ, Balance in Australian and New Zealand Peritoneal Dialysis Patients; df, degree of freedom.
solutions are required to understand how the benefit of improved RRF will translate on patient-level outcomes, such as technique failure or patient survival.

Disclosures
P.G.B. and A.K.J. have received grant support and honoraria from Baxter Inc.

References

Figure 5. Effect of neutral-pH, low–glucose degradation product (GDP) peritoneal dialysis solutions on 24-hour urine volume (milliliters per day). (A) Pooled analysis of all study durations. (B) Up to and including 6 months duration of treatment. (C) Beyond 6 months and up to and including 12 months duration of treatment. (D) Beyond 12 months duration of treatment. 95% CI, 95% confidence interval; baANZ, Balance in Australian and New Zealand Peritoneal Dialysis Patients; df, degree of freedom.


**Received:** May 30, 2014 **Accepted:** April 21, 2015

Published online ahead of print. Publication date available at www.jasn.org.

This article contains supplemental material online at http://jasn.asnjournals.org/lookup/suppl/doi:10.2215/CJN.05410514/-/DCSupplemental.