The ISPD Ad Hoc Committee and many groups have published guidelines for exit site care. All of these have been helpful and the use of Twardowski’s classification, or some similar nomenclature is mandatory for us to compare apples to apples. This is crucial for exit sites since the patient serves as his/her own control and how it looked at the previous visit serves as the control. So I endorse the guidelines/classifications and encourage their routine use.

**Catheter Placement**
Exit site infections cause 10 to 40% of all catheters lost and similar figures for cause of transfer to hemodialysis. Despite this, exit site infections (ESI) are less frequent than hemodialysis access problems. When the catheters are placed correctly, the distal subcutaneous exit site is about 2 cm from the exit site and the exit site itself is downward directed. For obese individuals the subcutaneous cuff should be 3 cm from the exit site. This down-going direction has been associated with a lower incidence of infection, presumably because skin debris, sweat, pus and other material drains out and away from the sinus tract. The use of Swan-neck catheters assures a down-directed exit site. Most centers now prefer 2 cuffs, although studies have not shown a clear advantage over one cuff. By having the deep cuff in the abdominal wall musculature, a better host defense barrier is created as well as a firmer tissue for cuff in-growth and better anchoring. The presternal catheter has all these advantages plus that of exiting in the chest such that it is out of immersion during regular baths and is often easier to see and dress for certain patients with protuberant abdomens. Belts or tight garments must not repeatedly traumatize the exit site and the subcutaneous tunnel close to the exit site.

**Catheter Care**
Experienced PD nurses describe catheter care best. Certain tricks that seem to be widely popular are mentioned here. The avoidance of occlusive dressings by covering with more simple dressings, such as sterile gauze, allows the exit site to breathe. After healing, daily care with a nonirritating, nontoxic, antibacterial liquid cleansing agent is prudent. Anchoring such that the catheter is immobilized is crucial.

**Exit Site Infections**
One half of ESIs are caused by *Staphylococcus aureus* and another 15% by other Gram-positive bacteria. About a quarter of all ESIs are caused by Gram-negative bacteria. *Staphylococcus aureus* exit site colonization increases the risk of *Staphylococcus aureus* peritonitis by 10 fold and *Pseudomonas* exit site colonization increases the risk of *Pseudomonas* peritonitis by 60 fold.

The treatment of exit site infections can be simple or complex depending on tunnel or peritoneal involvement, catheter contamination, etc. Prevention is the highest priority. So in addition to the care outlined above and described in detail in guidelines, the following discussion of the use of mupirocin may be helpful.

*Staphylococcus aureus* nasal carriage is associated with a higher incidence of both *Staphylococcus aureus* ESIs and episodes of *Staphylococcus aureus* peritonitis. Thus, an aggressive approach to eradicate *Staphylococcus aureus* nasal carriage was initially undertaken. Several regimens using intermittent oral antibiotics (rifampin, TMP/SMZ), and twice to thrice daily administration of intranasal mupirocin have all been shown to be effective. Infection rates for both ESI and peritonitis were reduced by two-thirds.

[Over]
Use of Mupirocin at Exit Site

The intermittent oral antibiotic regimens exposed patients to systemic drugs and required discipline to determine when to take the medicine and then to actually take it as prescribed. The application of intranasal mupirocin has fallen out of favor because it was unpleasant to perform and required frequent application. So almost by default, the application of mupirocin to the exit site has been the preferred prophylactic regimen. When compared directly to an oral rifampin regimen, exit site mupirocin was equally effective in lowering the yearly rate of *Staphylococcus aureus* ESIs in Pittsburgh. In 4 large studies, two using nasal mupirocin and 2 using exit site mupirocin, the yearly rate of *Staphylococcus aureus* peritonitis was slightly lower in both the exit site study groups. Again in Pittsburgh the incidence of catheter related *Staphylococcus aureus* peritonitis was markedly reduced after a mupirocin prophylactic regimen was utilized routinely. Furthermore, for central vein hemodialysis catheter prophylaxis, mupirocin at the exit site has been shown to reduce *Staphylococcus aureus* skin isolates and *Staphylococcus aureus* bacteremia episodes.

The point prevalence of *Staphylococcus aureus* carriage varies from 10 to 50%. Intermittent carriage is common. Diabetes mellitus may be a predisposition. For these reason, many dialysis centers have opted to treat all exit sites (peritoneal, cuffed, tunneled hemodialysis and non-cuffed hemodialysis catheters) with daily mupirocin. Mupirocin actually has activity against many bacteria but is best known for it activity against *Staphylococcus aureus*. It is prepared as both an ointment and as a cream, but the cream has been associated with damaging certain catheter material such as polyurethane. Since one does not always know the composition of the catheter material, it seems most prudent to simply use the ointment and to avoid the cream preparation altogether. In this regard, the prescription should specify mupirocin 2% ointment. When not specified, the pharmacist may simply dispense the cream. The simplest regimen is the application directly to the exit site at each dressing change. A 30-gram tube can last for 2 months.

Mupirocin should be applied the first time after catheter placement at the first dressing change. Many programs want the catheter anchored and left alone for perhaps even a week after placement. That being the case (I agree with that approach), then first application of mupirocin may be a week later. Most of us who use it apply it at the first dressing change after surgery, and at each dressing change thereafter, then with daily exit site care.

The Toronto group has performed surveillance studies over the first 4 years of their mupirocin prophylactic program. Resistance at one year was not found at all, but by four years, it was 3%. So mupirocin resistance develops slowly, but should not deter us from using this very valuable prophylactic agent. The use of mupirocin prophylaxis must not give a false sense of security such that the other measures described above are abandoned. On the contrary, the prevention of ESI should be paramount and we must use all of the individual tools we know to be effective.