Tidal PD
Indications and Prescription

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ADC Seattle 2016
Disclosures

- I flow 🍎 = 🍏 both ways

different but equal
Goals Today

• What is tidal PD?
• Why is it used?
• How do you prescribe it?
What Does This Mean?

Tidal setting 80%.
Initial fill 2000 ml.
Total UF 500ml.
4 exchanges.
Full drain every 4 cycles

Overnight Cycles:
Dwell 1: -273 ml
Dwell 2: 123 ml
Dwell 3: 124 ml
Dwell 4: 1115 ml
Total UF: 1089 ml
The Genesis of Tidal

- CAPD patients failing PD
  - Inadequate UF (high transporters)
  - Abdominal pressure complications
- Switched to cycler
  - Limited to 8 hours (nights)
  - How to increase clearance 3x?

Twardowski Z et al. in Ambulatory Peritoneal Dialysis 1990, pp.145-149
Cycler PD Schematic

No Fluid Contact with Peritoneal Membrane
Theory Behind Tidal

• Don’t drain the patient completely
• Should increase cycler clearance by two mechanisms
  - Maintaining continuous dialysis with reserve volume
  - Avoids “gaps” in PD during drain and fill cycles
Tidal PD Schematic

- Tidal Volume
- Reserve Volume

Constant Dialysate Contact
The Rise of Tidal

- Tidal efficiency depends on 2 factors:
  - Sufficient reserve volume
  - Adequate mixing of dialysate with fresh dialysis solution

Twardowski Z et al. in Ambulatory Peritoneal Dialysis 1990, pp.145-149
Initial Experiments

- PAC-X cycler
- Dialysis time: 8h
- 14 – 26L solution
- Tidal Vol: 0.8 L
- Reserve Vol: 1.7 L

Twardowski Z et al. in Ambulatory Peritoneal Dialysis 1990, pp.145-149
Tidal Clearance Superior to NIPD and CAPD

**FIGURE 1.** Mean urea clearances in 24-h CAPD, 8-h NIPD, and 8-h TPD in 3 patients with below mean (BM) and 3 patients with above mean (AM) peritoneal transport characteristics. In all (ALL), 6 patients.
High Dose Tidal Not Better Than Standard IPD

- Piraino et al. compared Tidal v. IPD
  - 30L total therapy over 8h
  - 2L total volume in peritoneal cavity
    - 1L (50%) tidal volume
    - 1L reserve volume
- No difference in solute clearances

Piraino B. Perit Dial Int 1994
Tidal Does Not Improve Clearances

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Dose of dialysis (l)</th>
<th>Total dialysis time (h)</th>
<th>Average dextrose concentration (%)</th>
<th>Tidal volume (% of fill volume)</th>
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<tr>
<td>Steinhauer et al.</td>
<td>6</td>
<td>23</td>
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Fernando SK, Finkelstein FO. Kidney Int 2006
The Fall of Tidal?

- Higher cost without better results
- “Primary role is for patient comfort”
  - Reduce drain pain
  - Decrease nighttime alarms
  - Improve patient sleep

Fernando SK, Finkelstein FO. Kidney Int 2006
Tidal is For Comfort, Not Clearance

- Target 200-300 ml reserve volume
  - Just enough to float the catheter
Low Reserve Volume Tidal

Figure 13-1, Baxter Home Choice APD Trainer’s Guide 2010
Prescribing Tidal PD

“We’re really more of a department.”
What does 70% tidal mean?

- a. 70% of initial fill is the reserve volume
- b. 70% of tidal volume is the reserve volume
- c. 70% of tidal volume is drained each cycle
- d. 70% of initial fill is the tidal volume
Tidal Fill: % or Volume

Fill Volume (ml)

- Initial Fill: 2000 ml
- 90% Tidal: 1800 ml
- 70% Tidal: 1400 ml
- 50% Tidal: 1000 ml
Reserve Volume
(Initial Fill – Tidal Volume)

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<th>Initial Fill</th>
<th>90% Tidal</th>
<th>70% Tidal</th>
<th>50% Tidal</th>
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<tr>
<td>Fill Volume</td>
<td>2000</td>
<td>1800</td>
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<td>1000</td>
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<tr>
<td>Reserve</td>
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<td>200</td>
<td>600</td>
<td>1000</td>
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Fill Volume (ml)  Reserve Volume (ml)
Which is true?

a. The reserve volume changes in response to positive or negative ultrafiltration
b. Excess reserve volume may reduce efficiency of dialysis
c. Low reserve volume may cause alarms or drain pain
d. All of the above are correct
How to Program UF

- **Home Choice**
  - Rx Total UF for the entire treatment
  - Total UF divided by the number of cycles is the additional amount drained each exchange

- **Liberty**
  - Set Tidal Drain volume for each exchange
What Happens if UF is Not Considered?

- Initial Fill Volume
- Overfill
- Ultrafiltration
- Reserve Volume

Not Programming UF Can Increase IPP

Ultrafiltration Increases Reserve Volume
How to Avoid Overfill

- Program the cycler to remove the anticipated UF volume
- Fully drain the abdomen during the course of treatment
Programming Tidal UF is Often Guesswork

Effect is to Reduce Risk of Overfill

Programmed UF is Removed

Initial Fill Volume

Tidal Volume

Reserve Volume
Drain Pain Can Result if UF is Set Too High

Initial Fill Volume

Reserve Volume

Programmed UF is Greater than Actual UF.

Reserve Volume Decreases
Full Drain Tradeoff

- Default full drain is after 3rd cycle
  - Decreasing the # of cycles reduces the benefit of Tidal
  - Increasing the # of cycles raises the risk of overfill
Calculate Tidal Fill and Drain

Tidal setting 80%.
Initial fill 2000 ml.
Total UF 500ml.
4 exchanges.
Full drain every 4 cycles.

Tidal Volume
2000 x 0.8 = 1600 ml

Reserve Volume
2000 – 1600 = 400 ml

UF per cycle
Total UF/ # exchanges
500/4 = 125 ml

Tidal Drain
Tidal Volume + UF per cycle
1600 + 125 = 1725 ml
Can You Interpret This?

Overnight Cycles:
Dwell 1:  -273 ml
Dwell 2:  123 ml
Dwell 3:  124 ml
Dwell 4:  1115 ml
Total UF:  1089 ml

Initial Fill  2000 ml
- Tidal Volume  1600 ml
- UF per cycle   125 ml
  Net UF  -275 ml

UF per cycle = +125 ml

Reserve volume  400 ml
+ UF per cycle   125 ml
+ Remaining UF  590 ml
  Full drain  1115 ml

IP volume @ full drain
1600 + 1115 = 2715 ml

Change Programmed UF* or Tidal Volume%
**WONG'S TIDAL PD WORKSHEET**

Do not enter any data in the white cells. Do not save data.

<table>
<thead>
<tr>
<th>Full Drain Setting *</th>
<th>Total Actual UF Volume (ml)</th>
<th>Max Actual UF per cycle (ml)</th>
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<tr>
<td>4</td>
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<th>Fill Volume (ml)</th>
<th># Exchanges</th>
<th>Total Volume (ml)</th>
<th>Last Fill (ml)</th>
<th>Tidal Percentage</th>
<th>Tidal Volume (ml)</th>
<th># Full Drains</th>
<th>Delivered Volume (ml)</th>
<th>Total UF Rx (ml)</th>
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**Instructions (fill in yellow boxes)**

1. enter the cycler fill volume and last fill volume (if applicable)
2. enter the tidal percentage (%)
3. enter the total prescribed UF
4. enter the total actual UF volume (if known)
5. enter the largest per cycle UF volume observed

*Default Full Drain Setting is 3 (model is valid for settings 1-6)

**Use the reserve volumes corresponding to the # of cycles before full drain

***Maximum Cycler IP volume is the greater of the Max UF per cycle plus tidal volume or the prescribed fill volume
Goals Review

• What is tidal PD?
• Why is it used?
• How do you prescribe it?
Special Thanks To:
Mark Smith RN
Jeannie Farina RN
Steve Guest MD

Questions?
wongl@ccf.org
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*Default Full Drain Setting is 3 (model is valid for settings 1-6)
**Use the reserve volumes corresponding to the # of cycles before full drain
***Maximum Cycler IP volume is the greater of the Max UF per cycle plus tidal volume or the prescribed fill volume