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18 Tweets • 2022-02-17 16:40:44 UTC • See on Twitter

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1/18 Hello #Nephtwitter #Medtwitter, @aspneph radiology webinar topic for Dec 2021 was #Peritonealdialysis (PD) and complications.
But first, let's have a poll. #Pedneph #ASPNFOAM
Why is PD preferred to hemodialysis (HD) in a child with end-stage kidney disease (ESKD)?

2/18 Ans: All of the above
Other advantages of PD:
📌decreased travel compared to HD
📌PD can be performed in comfort of home
📌decreased need for vascular access and related complications
📌gentle dialysis
📌being closer to a more physiologic process

PMID 34731538, 26256980

3/18 Complications can be split into infectious and non-infectious
Infectious complications include:
1. Exit site infection
2. Tunnel infection
3. PD peritonitis

PMID 32728843

4/18 Let's focus on non-infectious complications. What are the common non-infectious complications of PD?

PMID 32728843

5/18 Ans: All of the above
Mechanical complications lead to poor fluid removal and may be due to:
1. Catheter kinking
2. Constipation
3. Catheter migration

PMID 34731538, 31028108

Classification

Mechanical	Technique-related	Other
Hernias	Ultrafiltration failure	Sleep disorder
Leak	Inadequate dialysis	Calciphylaxis
Hydrothorax	Sclerosing peritonitis	Seizure
Hemoperitoneum	Calcification	Pancreatitis
Obstruction	Hypo or Hypervolemia	Amyloidosis

BA Warady, FS Schaefer, RN Fine, Sr Alexander. Pediatric Dialysis
Pg 415-442

6/18 Amongst all the complications, catheter malfunction appears to be the more frequent non-infectious complication

Table 5. Comparison of This Study with Other Pediatric Studies for Noninfectious Complications of PD

	Hooman, et al.[6]	Aksu, et al.[7]	Rinaldi, et al.[8]	Rahim, et al.[9]	Kim, et al.[10]	Park, et al.[4]	Ours
Publication yr	2009 (Iran)	2007 (Turkey)	2004 (Italy)	2004 (USA)	2011 (Korea)	2003 (Korea)	(Korea)
Study period	1993–2006	1995–2005	1986–2000	1990–2000	2001–2008	1991–2002	1986–2012
Number of patients	122 (102 catheters)	93 (108 catheters)	363 (503 catheters)	90 (127 catheters)	34 (34 catheters)	70 (93 catheters)	60 (70 catheters)
Age	<14 yrs	3 months–16 yrs	<15 yrs	0–21 yrs	<18 yrs	<18 yrs	<18 yrs
Noninfectious complications of PD episode (episodes/catheter, %)							
Catheter malfunction	25 (24.5)	14 (13.0)‡	24 (4.8)	27 (21.3)	2 (5.9)‡	9 (9.7)	10 (14.3)
Leakage	18 (17.6)	0 (0)	26 (5.2)	18 (14.2)	3 (8.8)	2 (2.2)	7 (10.0)
Abdominal pain	-	-	-	-	-	-	3 (4.3)
Dislocation	-	12 (11.1)	26 (5.2)	-	-	0 (0.00)	2 (2.9)
Hernia	25 (24.5)	0 (0)	-	-	-	-	6 (8.6)
Peritoneal bleeding	-	-	6 (1.2)	-	0 (0.00)	3 (3.2)	5 (7.1)
Catheter insertion site bleeding	14 (13.7)*	-	-	-	1 (2.9)	-	2 (2.9)

PD, peritoneal dialysis.
*Bleeding after surgery, location was not described, †Including drainage problems and kinking, ‡Sum of obstruction and migration.

PMID 26256980

7/18 Risk factors for increased catheter malfunctions in patients:

📌less than 1 year of age

📌with lack of omentectomy

📌with immediate use/use of catheter before maturation

PMID 30203179, 23331815, 30217181

Table 1 Complications by age

	Infant ($n=72$)	Children ($n=85$)	p value
Age [mean (SD)]	0.3 (0.29)	7 (5.56)	<0.001
Follow-up time (days) [mean (SD)]	($n=62$)	($n=78$)	
	180 (519.8)	180 (402.6)	0.952
Leakage	15 (21%)	7 (8%)	0.036*
Infection	7 (10%)	9 (11%)	1.00
Adhesion	4 (6%)	5 (6%)	1.00
Migration	3 (4%)	6 (7%)	0.509
Hernia	11 (15%)	4 (5%)	0.030*
Replacement	($n=62$)	($n=68$)	
	11 (18%)	11 (16%)	0.820

*Fisher's exact test $p<0.05$

PMID 30203179

Table 3 Complications following same day or delayed catheter usage

	Same day ($n=87$)	Delayed ($n=34$)	p value
Age [mean (SD)]	4 (5.37)	3 (5.51)	0.532
Follow-up time (days) [mean (SD)]	($n=74$)	($n=33$)	
	208 (598.2)	138 (173.8)	0.354
Leakage	17 (20%)	4 (12%)	0.426
Infection	6 (7%)	3 (9%)	0.710
Adhesion	5 (6%)	2 (6%)	1.00
Migration	4 (5%)	2 (6%)	0.673
Hernia	6 (7%)	2 (6%)	1.00
Replacement	($n=79$)	($n=34$)	
	13 (16%)	6 (18%)	1.00

*Fisher's exact test $p<0.05$

PMID 30203179

Table 4 Complications following omentectomy

	Omentectomy ($n=82$)	No omentectomy ($n=71$)	p value
Age [mean (SD)]	4 (4.71)	4 (5.92)	0.373
Follow-up time (days) [mean (SD)]	($n=71$)	($n=65$)	
	208 (590.9)	159 (261.2)	0.526
Leakage	13 (16%)	9 (13%)	0.648
Infection	7 (9%)	7 (10%)	0.787
Adhesion	4 (5%)	5 (7%)	0.734
Migration	4 (5%)	5 (7%)	0.734
Hernia	5 (6%)	9 (13%)	0.174
Replacement	($n=67$)	($n=60$)	
	5 (7%)	16 (27%)	0.004*

*Fisher's exact test $p<0.05$

PMID 30203179

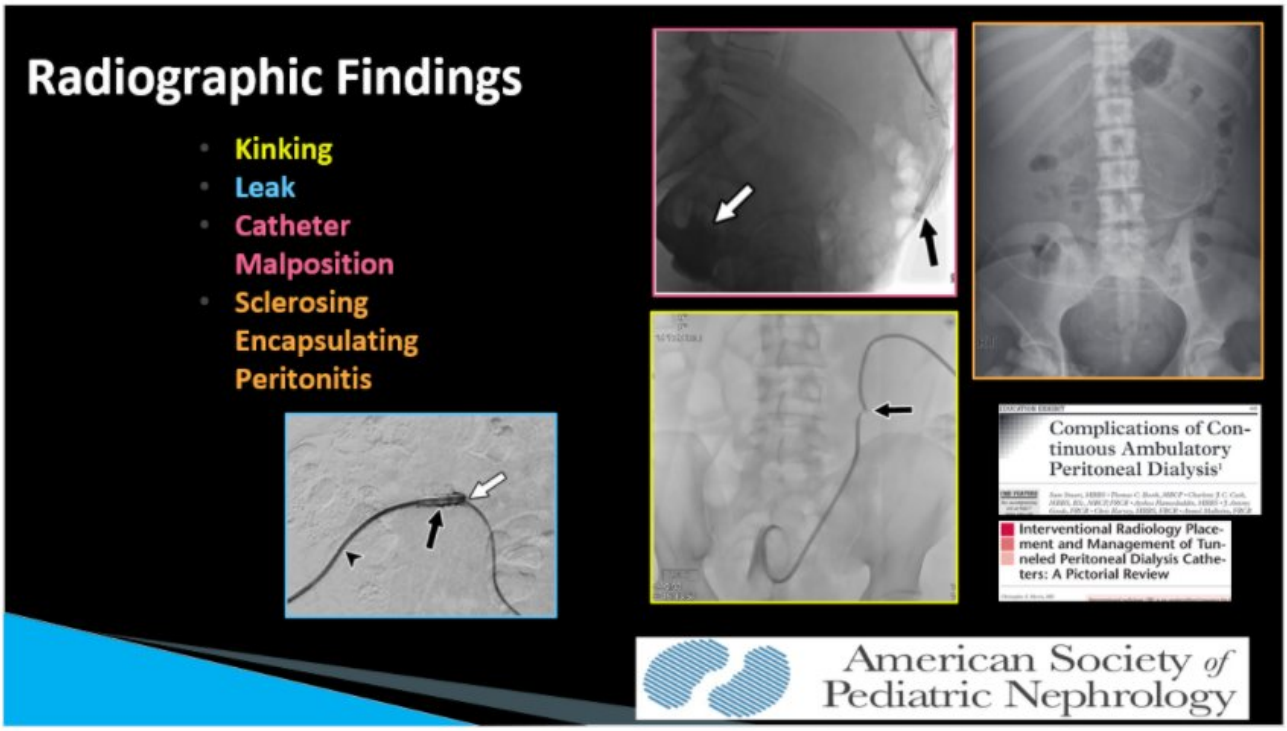
8/18 Management of non-infectious complications

1) Imaging-XR abdomen: can identify hydrothorax, perforation

📌Pros: widely available, cheaper, time-sensitive

📌Cons: less sensitive than CT/ MRI

📌CT abdomen is preferred if encapsulating peritoneal sclerosis (EPS) suspected



PMID: 23225216

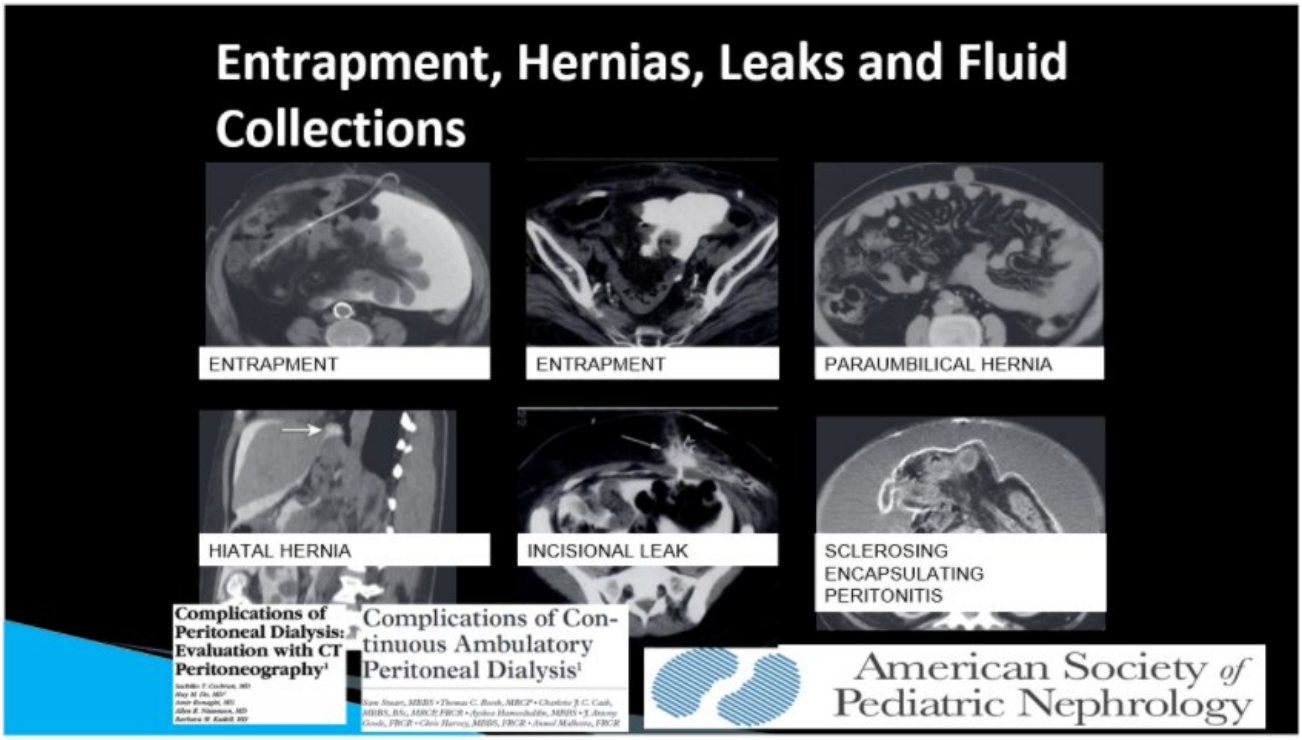
9/18

2)CT Peritoneography:GOLD standard->exam of peritoneal cavity

📌Method: 2L dialysate w/100mL nonionic contrast medium w/300mL iodine/mL. Ambulate for 1 hr & use prone position for images

📌Cons: exposure to iodinated contrast media &ionizing radiation

📌C/I:Contrast allergy



PMID: 19325058

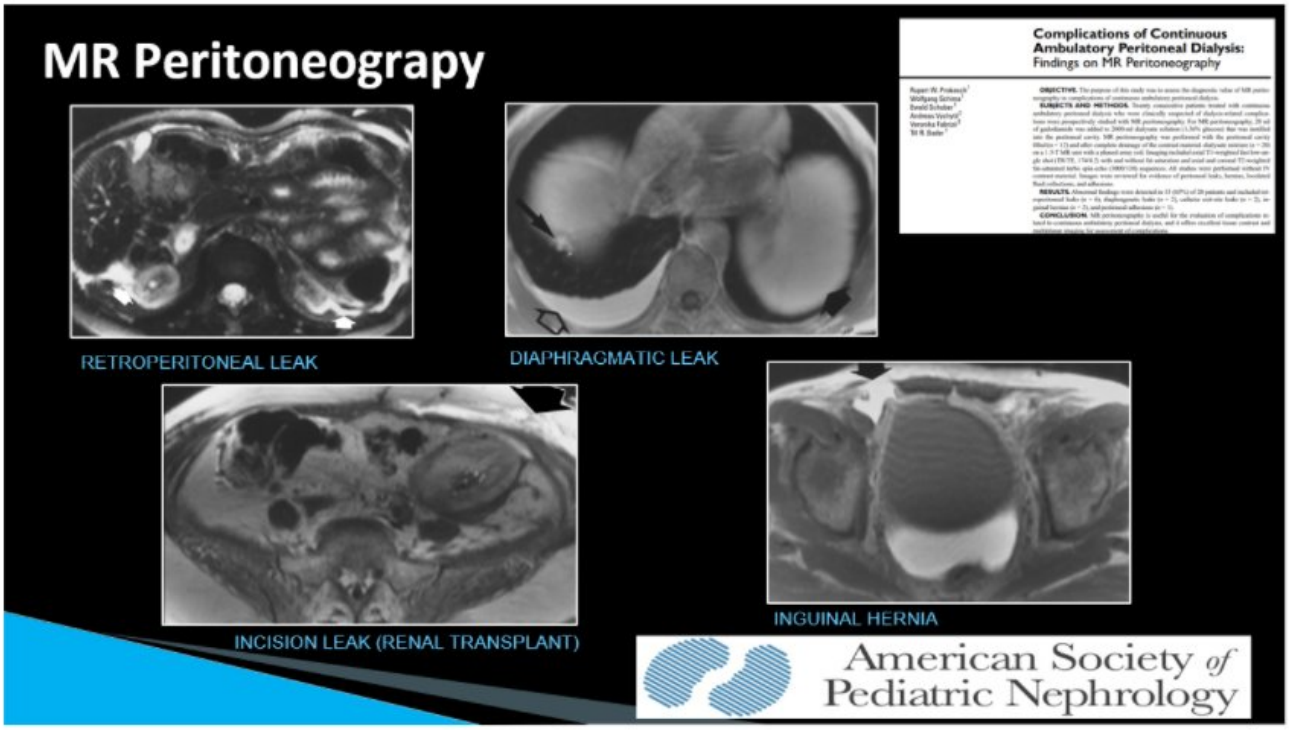
10/18

3) What about MR Peritoneography?

📌Method: Similar technique as CT, can be performed with just dialysate as the contrast media

📌Cons: More expensive than XR or CT, limited availability

📌C/I: metallic objects in the body



PMID: 19325058

11/18 Metabolic complications like weight gain due to glucose load is another non-infectious complication

📌Icodextrin reduces this side effect to some extent, but need to take the cost and availability of icodextrin into account

PMID 26256980

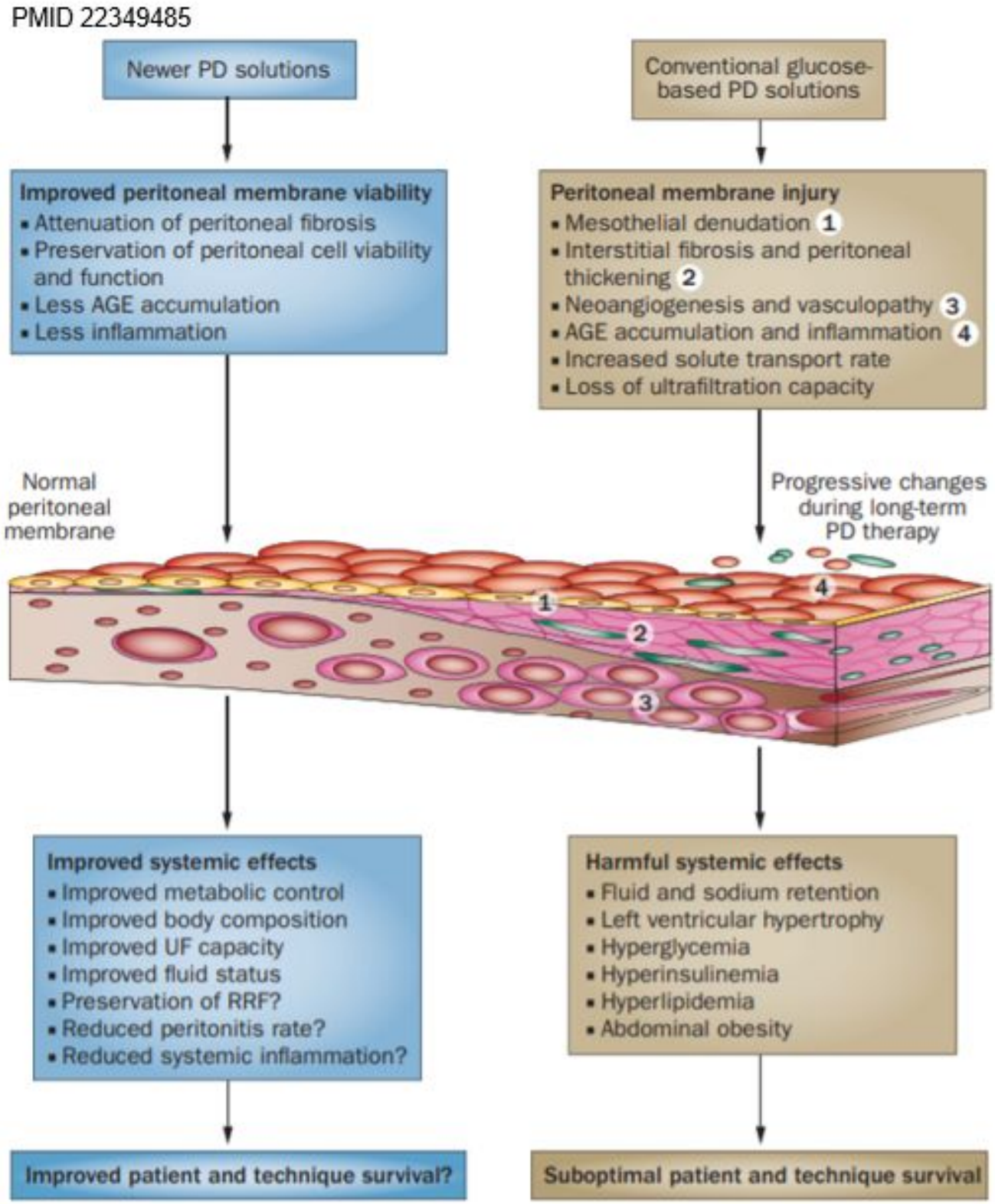


Figure 1 | A schematic presentation of the potential beneficial effects of newer peritoneal dialysis solutions. Abbreviations: AGE, advanced glycation end product; PD, peritoneal dialysis; RRF, residual renal function; UF, ultrafiltration.

12/18 EPS is one of the most severe non-infectious complications.

Do you know how long it takes to develop EPS?

13/18 Ans: 5+yrs

Risk Factors:

📌long-term exposure to PD fluids

📌multiple/recurrent peritonitis bouts

📌genetic predisposition

📌meds: ex-practolol, chlorhexidine

Symptoms: severe abdominal pain, persistent n/v

Diagnosis: CT scan->cocooning of bowel & cystic fluid collections

PMID 34731538, 32728843, 31744097

14/18 Treatment of EPS: There is no standard treatment. PD is typically discontinued.
Early treatment with glucocorticoids, tamoxifen, immunosuppression may be useful
Symptomatic treatment: pain management, parenteral nutrition

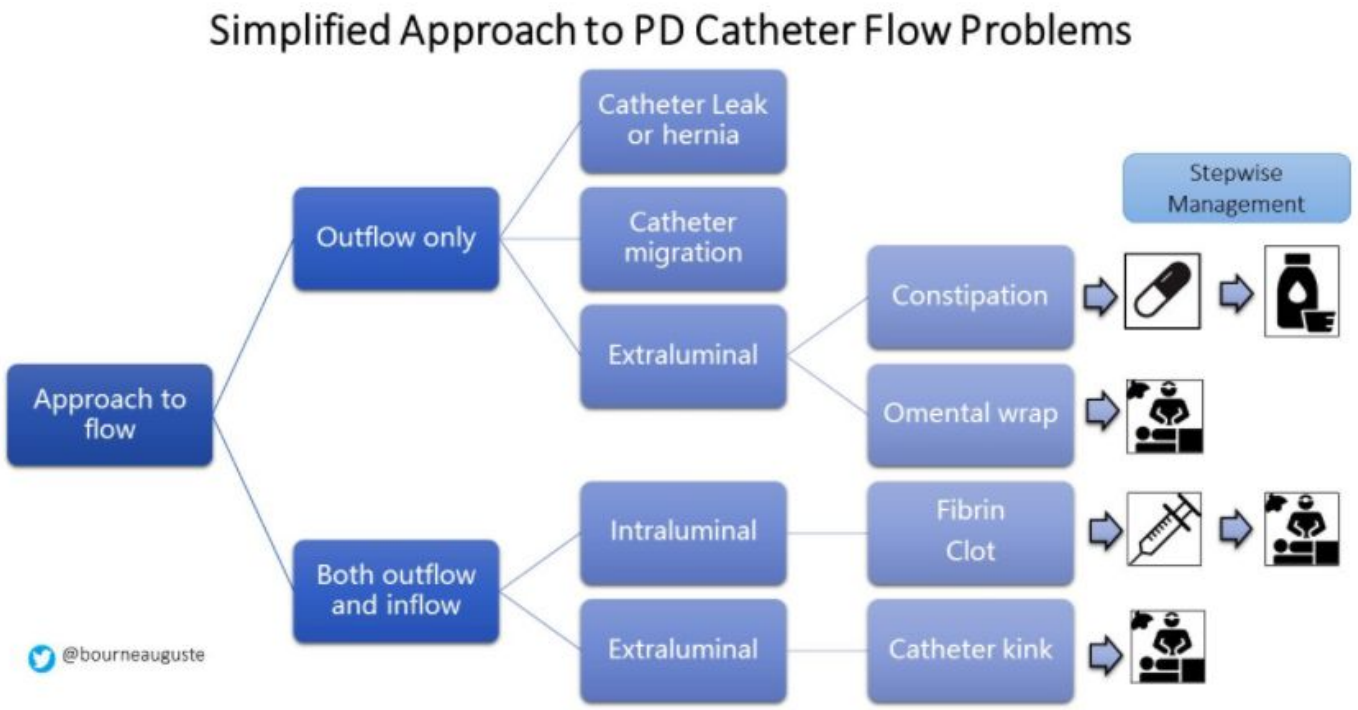
PMID 31744097

Table 1. Overview on currently applied and experimental pharmacological treatments in EPS.

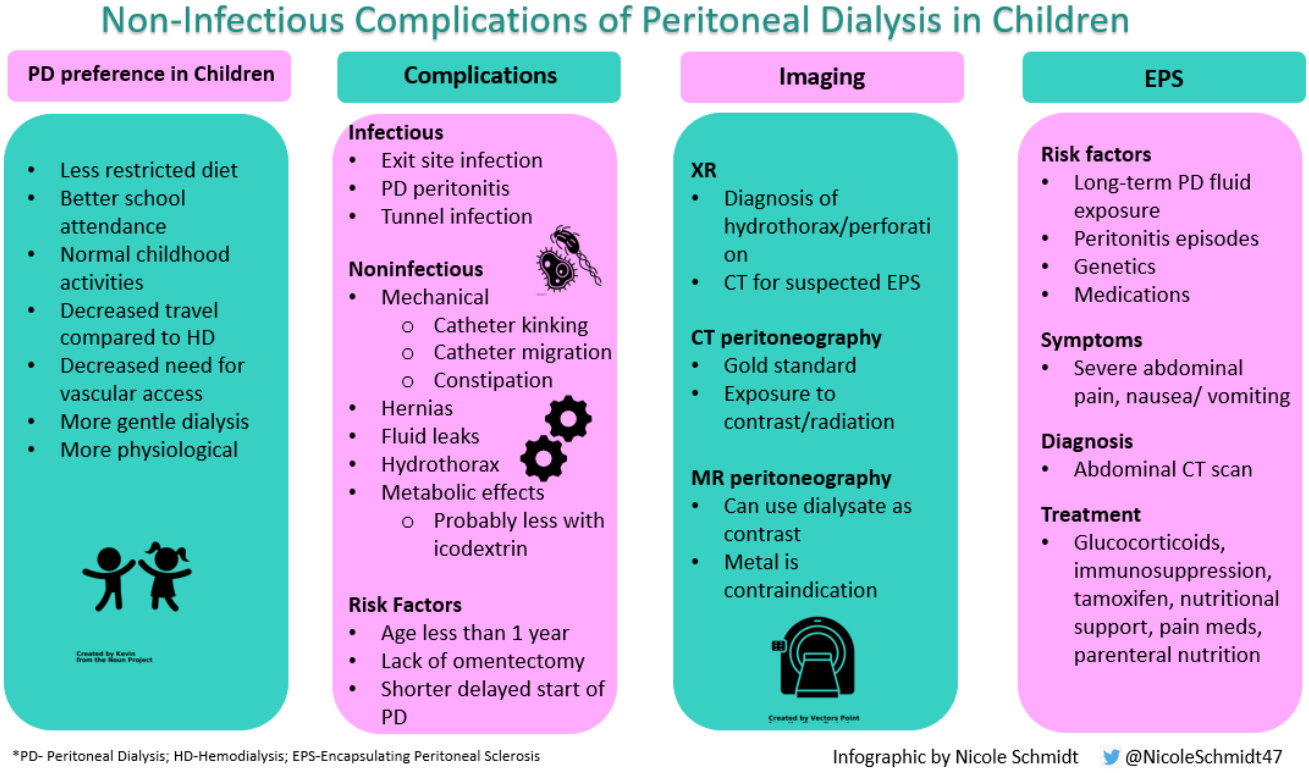
Class	Drug Name	Mode of Action
Glucocorticosteroids	Prednisone Prednisolone	Immunosuppressant, inhibits monocyte chemoattractant protein 1 (MCP-1) synthesis, regulates extracellular matrix (ECM) protein synthesis, ECM protein maturation
Immuno-suppressants	Azathioprene Rapamycin/Sirolimus Mycophenolate mofetil Cyclosporine	Inhibits DNA/RNA synthesis Inhibits T-cell/B-cell activation De-novo purine synthesis blockade Lowered T-cell activity
Hormonal antagonist	Tamoxifen Angiotensin converting enzyme inhibitor (ACEi)/Angiotensin II receptor blocker (ARB) Perindopril Candesartan	Blocks transforming growth factor-β1 (TGF-β1) signaling Blocks TGF-β1 signaling Blocks TGF-β1 signaling, lowered cell proliferation
Mucolytic alkaloid	N-acetylcysteine (NAC) Colchicine	Reactive oxygen species scavenger Blocks TGF-β1 mRNA expression
Xanthine derivative	Pentoxifylline	Fibrinoltyic, suppressed collagen synthesis, angiogenesis
Anti-diabetic	Rosiglitazone	Peroxisome Proliferator-Activated Receptor (PPAR)-agonist, suppressed inflammation, neovasculature
Anti-fibrotic, anti-inflammatory	Pirfenidone	Reduces tissue inhibitor of metalloproteinases-1 (TIMP-1), tumor necrosis factor-α (TNF-α), and TGF-β1 expression,
Immuno-modulator	Thalidomide	Anti-angiogenic, anti-proliferative, antifibrotic
Anti-fungal	Itraconazole	Decreased TGF-β1 expression
Autologous stem cell therapy		Mesothelial/submesothelial cellular layer repair

PMID 31744097

15/18 Here is a stepwise approach to catheter malfunction by @bourneauguste



16/18 For children on PD, it is important to be aware of the non-infectious complications which could be as detrimental as infectious!! Here's an infographic summarizing the various complications of PD in children!



17/18 For a case-based clinical discussion on non-infectious complications of #peritonealdialysis with a radiologist and an expert, login to @ASPNeph website, Dec 2021 webinar #Membereducation #NSMC2022

18/18 Special thanks to #ASPNFOAM @drM_sudha @nefron1310 @SwastiThinks @CatherineJ20 @RoshanPGeorgeMD @priti899

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