

TABLE 2. Table for the diagnostic classification of exit site

ATTRIBUTES	EXTERNAL ZONE					
	P	I	R	M	C	X
DIAGNOSTICS	P	I	R	M	C	X
0 PERFECT	P0	I0	R0	M0	C0	X0
1 GOOD EXIT	P0	I0	R1	M1	C1	X1
2 EQUIVOCAL	P0	I0	R2	M2	C2	X2
3 ACUTE INFECTION	P3	I3	R3	M3	C3	X3
4 CHRONIC INFECTION	P4	I4	R4	M4	C4	X4
5 CUFF INFECTION	P0	I5	R0	M0	--	X5
6 TRAUMATIC	P6	I0	R6	M0	C6	X6

ATTRIBUTES	INTERNAL ZONE		
	E	IG	S
DIAGNOSTICS	E	IG	S
0 PERFECT	E0	IG0	S0
1 GOOD EXIT	E1	IG1	S1
2 EQUIVOCAL	E2	IG2	S2
3 ACUTE INFECTION	E3	IG3	S3
4 CHRONIC INFECTION	E4	IG4	S4
5 CUFF INFECTION	E5	IG5	S5
6 TRAUMATIC	E6	IG0	S0



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TABLE 3. Diagnostic classification of peritoneal catheter exit site (according Twardowski, modified)

PERFECT	Grade 0	Grade 1	Grade 2	Grade 3
More than 3 – 6 months	• Normal skin. Natural colour or dark brown	• Natural skin, dark brown, or pale pink, 1 – 2 mm	• Bright pink or red skin 2 – 3 mm (13 a./T)	• Pain or tenderness
• Mature epithelium in the sinus	• Dry sinus	• Epithelium covers 1 – 6 mm into the sinus but mucosal epithelium covers deeper sinus	• Macerated epithelium or absence of epithelium up to 50 % of the sinus	• Swelling of the exit site
• Crust every > 7 days	• Crust every 3 – 7 days, on the dressing	• Crust (thick exudation, or specks) every 3 – 7 days, on the sinus (scanty)	• Granulation tissue slightly exuberant: external or in the sinus (<=50%)	• Red skin > 3 – 4 mm (13 a./T)
Absence of:	• Clear or white thick secretion in the sinus (scanty)	• Absence of:	• External exudation: dried or serosal (scanty)	• Absence of epithelium in the sinus (>75 %)
• Pain	• Swelling	• Pain	• Internal secretion: serosal (more than scanty) or thick or bloody, only in the sinus	• Exuberant granulation tissue external or internal
• Pink or red skin	• Bright pink or red colour	• Bright pink or red colour	• Crust every 1 – 2 days or dried exudation or adhered crust difficult to remove	• External serous exudation outside of the sinus (plentiful), or bloody or purulent exudation/secretion (any quantity) internal or external
• Granulation tissue (none)	• Exuberant granulation tissue	• Exuberant granulation tissue	• Absence of:	• Crust or scab every 1 – 2 days
• External exudation (none)	• External exudation	• External exudation	• Pain	• Duration < 4 weeks
• Internal secretion	• Internal secretion (abundant)	• Internal secretion (abundant)	• Swelling	• Exuberant granulation tissue external or internal
			• Bleeding	• External serous exudation outside of the sinus (plentiful), or bloody or purulent exudation/secretion (any quantity) internal or external
			• Exuberant granulation tissue	• Crust or scab every 1 – 2 days
			• Secretion outside of the sinus	• Duration < 4 weeks

GOOD EXIT SITE	Grade 1	Grade 2	Grade 3	Grade 4
More than 6 weeks	• Natural skin, dark brown, or pale pink, 1 – 2 mm	• Bright pink or red skin 2 – 3 mm (13 a./T)	• Macerated epithelium or absence of epithelium up to 50 % of the sinus	• Tenderness or not
• Epithelium covers 1 – 6 mm into the sinus but mucosal epithelium covers deeper sinus	• Crust (thick exudation, or specks) every 3 – 7 days, on the dressing	• Granulation tissue slightly exuberant: external or in the sinus (<=50%)	• External exudation: dried or serosal (scanty)	• Skin colour: the same as in acute infection or less intensely
• Crust every 3 – 7 days, on the sinus (scanty)	• Clear or white thick secretion in the sinus (scanty)	• External exudation: dried or serosal (scanty)	• Internal secretion: serosal (more than scanty) or thick or bloody, only in the sinus	• Exuberant granulation tissue external or internal
• Absence of:	• Swelling	• Crust every 1 – 2 days or dried exudation or adhered crust difficult to remove	• Crust or scab every 1 – 2 days	• Secretion: the same as in acute infection, but less quantity
• Pain	• Bright pink or red colour	• Absence of:	• Pain	• Duration > 4 weeks
• Swelling	• Exuberant granulation tissue	• Pain	• Bleeding	
• Exuberant granulation tissue	• External exudation	• Exuberant granulation tissue	• Scab in development	
• External exudation	• Internal secretion (abundant)	• Secretion outside of the sinus	• Deterioration of exit appearance	
• Internal secretion (abundant)				

CHRONIC INFECTION	Grade 4	Grade 5	Grade 6
Tenderness or not	• Tenderness or not	• Induration around the cuff	• Pain
• Skin colour: the same as in acute infection or less intensely	• Skin colour: the same as in acute infection or less intensely	• Normal skin (external)	• Bleeding
• Exuberant granulation tissue external or internal	• Exuberant granulation tissue external or internal	• Macerated epithelium (internal) intermittently or chronically inside the sinus	• Scab in development
• Secretion: the same as in acute infection, but less quantity	• Secretion: the same as in acute infection, but less quantity	• Intense granulation tissue deep inside the sinus	• Deterioration of exit appearance
• Duration > 4 weeks	• Duration > 4 weeks	• Exudation: intermittent or chronic: external or internal exudation/secretion (purulent, bloody or gluey), sometimes visible only after expression on the cuff	
		• Clot or dried blood in the sinus	
		(*) From external examination the exit site looks normal in most cases	

PERITONEAL CATHETER EXIT SITE

(TWARDOWSKI CRITERIA; MODIFIED)



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TABLE 1. Attributes and criteria used in exit site evaluation

EXTERNAL ZONE	
P - PAIN	X - EXTERNAL EXUDATION
P-0 None	X-0 None or specks of crust on the dressing every > 7 days
P-3 Painful	
P-4 Tenderness	
P-5 Tenderness	
P-6 Pain or Tenderness	
	M - MEASUREMENT (REDNESS) in mm (maximum from the edge of the sinus)
	M-0 0 mm (no redness)
	M-1 1-2 mm
	M-2 2-3 mm
	M-3 3-4 mm
	M-4 (> 13 according to Tw.)
I - INDURATION	X-3 Purulent or bloody exudation, or plentiful serous drainage
I-0 None	X-4 Purulent or bloody exudation, or plentiful serous drainage
I-3 Yes: at the exit site	
I-4 Slight	
I-5 Yes: at the external cuff	
	C - CRUST
	C-0 None or small every > 7 days
	C-1 Between 3 and 7 days
	C-2 Every 1-2 days
	C-3 Crust or scab every day
	C-4 every day
	C-6 Clot or scab in development
R - REDNESS OF THE SKIN	X-6 Fresh or recent blood
R-0 Normal skin or dark brown or dark brown or pale pink	
R-1 Dark, brown or pale pink	
R-2 Purplish or pink	
R-3 Red or bright pink	
R-4 } Deterioration of the skin	G - GRANULATION TISSUE
R-6 } Deterioration of the skin	G-0 None
	G-1 Plan granulation. No vessels visible
	G-2 Slightly exuberant or protruding
	G-3 Distinctly exuberant, bulging, shiny vessels visible, "proud flesh"
	G-4 appearance bleeds easily

INTERNAL ZONE (SINUS)	
E - INTERNAL EPITHELIUM	S - INTERNAL SECRETION
E-0 Mature epithelium, whole sinus	S-0 No secretion, wet
E-1 Epithelium 1-6 mm, or mucosal epithelium macerated	S-1 Serous or white thick secretion (not purulent)
E-2 Epithelium or absence of epithelium <=50% of the sinus	S-2 Serous or thick or bloody secretion only in the sinus
E-3 Epithelium >=50% of the sinus	S-3 Plenty of serous drainage, or bloody or purulent secretion in any quantity
E-4 macerated epithelium or absence >75% of the sinus	S-4 or purulent secretion in any quantity
E-5 Macerated intermitently or chronically	S-5 Clot or scab in the sinus or intermittent secretion or drainage after cuff expression
E-6 Broken epithelium due to trauma	

EXIT SITE EVALUATION PROCEDURE

In the table 1 the attributes are graded from 0 to 6 (criteria) to make memorizing and identification easier.

Grade 0: absence of the criterium, indicating a perfect state; grade 1: a good state; grade 2: equivocal; grade 3 and 4: either an acute or chronic infection which cannot be distinguished by observation; the persistence of inflammation signs for more than 4 weeks corresponds to a chronic infection in which case the inflammation signs are usually remarkably milder than in acute infection; grade 5: external cuff infection; and grade 6: traumatized exit site.

In each grade, only the most characteristic features are taken into account, although there may be other combinations of criteria in a given grade.

Once each attribute has been graded (for example: P-0, R-3, M-4,...), table 2 facilitates the diagnosis on the basis of the actual criteria. The 7 diagnostic categories are described in table 3.

If the criteria of an individual ES do not agree with one diagnosis (which is common), priority should be given to the most important criterium in the following order:

1. External (X) or internal secretion (S).
2. External (G) or internal granulation (IG).
3. Skin redness (R) and its measurement (M).
4. Pain (P) or induration (I).

In the table 4 the different grades of the main attributes are presented in photographs, as a visual aid. Some photographs are presented for a specific criterium although the patient may be classified in a different diagnostic grade or there may be other features (e.g. dermatitis) not related to the criterium studied.

The photographs of the table 4 were taken at different magnifications; thus the redness measurement has to bear relation to the width of the catheter. Note that traumatized ES is not included in table 4, because of the limited cases available.

[1] Twardowski Z. J., Ed.: Peritoneal exit-site morphology and pathology; prevention, diagnosis, and treatment of exit-site infections. *Perit Dial Intern* 1996; 16, suppl. 3: 1 - 117.

To define infection and pre-infection events of peritoneal catheter exit site (ES) Twardowski & Prowant described 7 diagnostic categories related to the classical criteria of inflammation [1]. We have used these criteria and we have made a diagnostic table, based on precisely graded attributes (criteria), easy to memorize and apply.

TERMINOLOGY

EXTERNAL ZONE

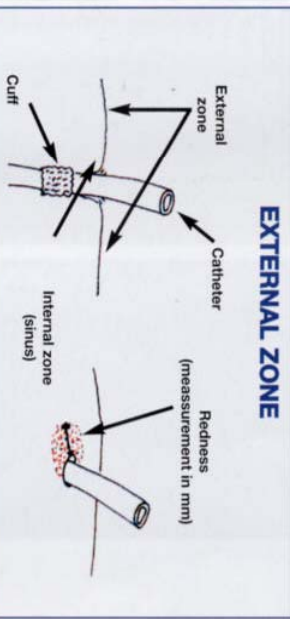
The skin surrounding the ES up until the sinus edge. In this zone the following should be evaluated: the skin colour as redness (R), measurement (M) of the skin redness (in mm: from the sinus edge to the most distant point of redness, which may be asymmetric), the presence of crust (C), exudation (D) and granulation tissue (G).

INTERNAL ZONE (SINUS)

Epithelium between the sinus rim and the deepest internal part which may be seen in the sinus. In this zone the internal epithelium (IE), the internal granulation (IG) tissue and the internal drainage (ID) should be evaluated.

The external cuff should be evaluated for induration (I) and tenderness (P).

EXTERNAL ZONE



INTERNAL ZONE (SINUS)

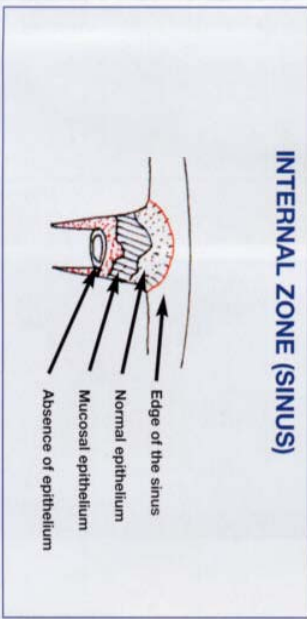











































TABLE 4. Photographic diagnostic table based on

	REDNESS OF SKIN (R)	MEASUREMENT OF REDNESS (M)	CRUST (C)	EXTERNAL EXUDATION (X)
GRADE 0	 R-0: Normal skin or dark brown	 M-0: 0 mm, no redness	 C-0: No or small every > 7 days	 X-0: No or crusts on dressing every > 7 days
GRADE 1	 R-1: Dark brown or pale pink	 M-1: 1-2 mm from the edge	 C-1: Between 3 and 7 days	 X-1: Dried exudation every 3-7 days
GRADE 2	 R-2: Purplish or bright pink	 M-2: 2-3 mm	 C-2: Every 1-2 days	 X-2: Dried / serous every 1-2 days
GRADE 3	 R-3: Red or bright pink	 M-3: > 3-4 mm (> 13 mm a./ Tw.)	 C-3: Crust or scab every day	 X-3: Purulent or bloody, or plentiful serous
GRADE 4	 R-4: Red or bright pink (lessened or mitigated)	 M-4: > 3-4 mm (it can be less)	 C-4: As C-3, or variable	 X-4: Purulent or bloody, or plentiful serous
GRADE 5				 X-5: Purulent or bloody; intermittent or chronic or after cuff expression

on graded attributes (Twardowski criteria, modified)

EXTERNAL GRANULATION (G)	INTERNAL EPITHELIUM (E)	INTERNAL GRANULATION (IG)	INTERNAL SECRETION (S)
			
G-0: No granulation	E-0: Mature epithelium, whole sinus	IG-0: No granulation tissue	S-0: No secretion, dry
			
G-1: Plain granulation	E-1: Epithelium 1-6 mm or mucosal epithelium	IG-1: Plain granulation, small extent	S-1: Serous or white thick secretion
			
G-2: Slightly exuberant, some vessels visible	E-2: Macerated or absence \leq 50%	IG-2: Slightly exuberant vessels visible, $<$ 50 % sinus	S-2: Serous / thick /bloody secretion only in the sinus
			
G-3: Exuberant, shiny, vessels visible, proud flesh	E-3: Regression or absence $>$ 50-75 %	IG-3: Exuberant, bulging, shiny, vessels visible, $>$ 75 % sinus	S-3: Plenty serous or any quantity of bloody or purulent secretion
			
G-4: Exuberant, bulging, bleeds easily, vessels visible	E-4: Regression or absence, macerated	IG-4: Exuberant, bulging, shiny, vessels visible, $>$ 75 % sinus	S-4: Plenty serous or any quantity of bloody or purulent secretion
			
G-5: Exuberant, bulging, bleeds easily, vessels visible	E-5: Intermittent, chronic macerated	IG-5: Granulation «proud flesh» deep inside the sinus	S-5: Clot / scab in the sinus or intermittent secretion or after cuff expression